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POPULATION, EMPLOYMENT AND WASTE GENERATION REPORT FOR

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STATE OF MONTANA
SOLID WASTE MANAGEMENT AND RESOURCE RECOVERY STUDY

DECEMBER, 1975 DRAFT REPORT

HENNINGSON, DURHAM & RICHARDSON
ENGINEERING • ARCHITECTURE • PLANNING • SYSTEMS • ECONOMICS
HELENA, MONTANA
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REPORT NO. 1

POPULATION, EMPLOYMENT AND WASTE GENERATION REPORT

FOR

STATE OF MONTANA

SOLID WASTE MANAGEMENT
AND
RESOURCE RECOVERY STUDY

DECEMBER 1975

DRAFT REPORT

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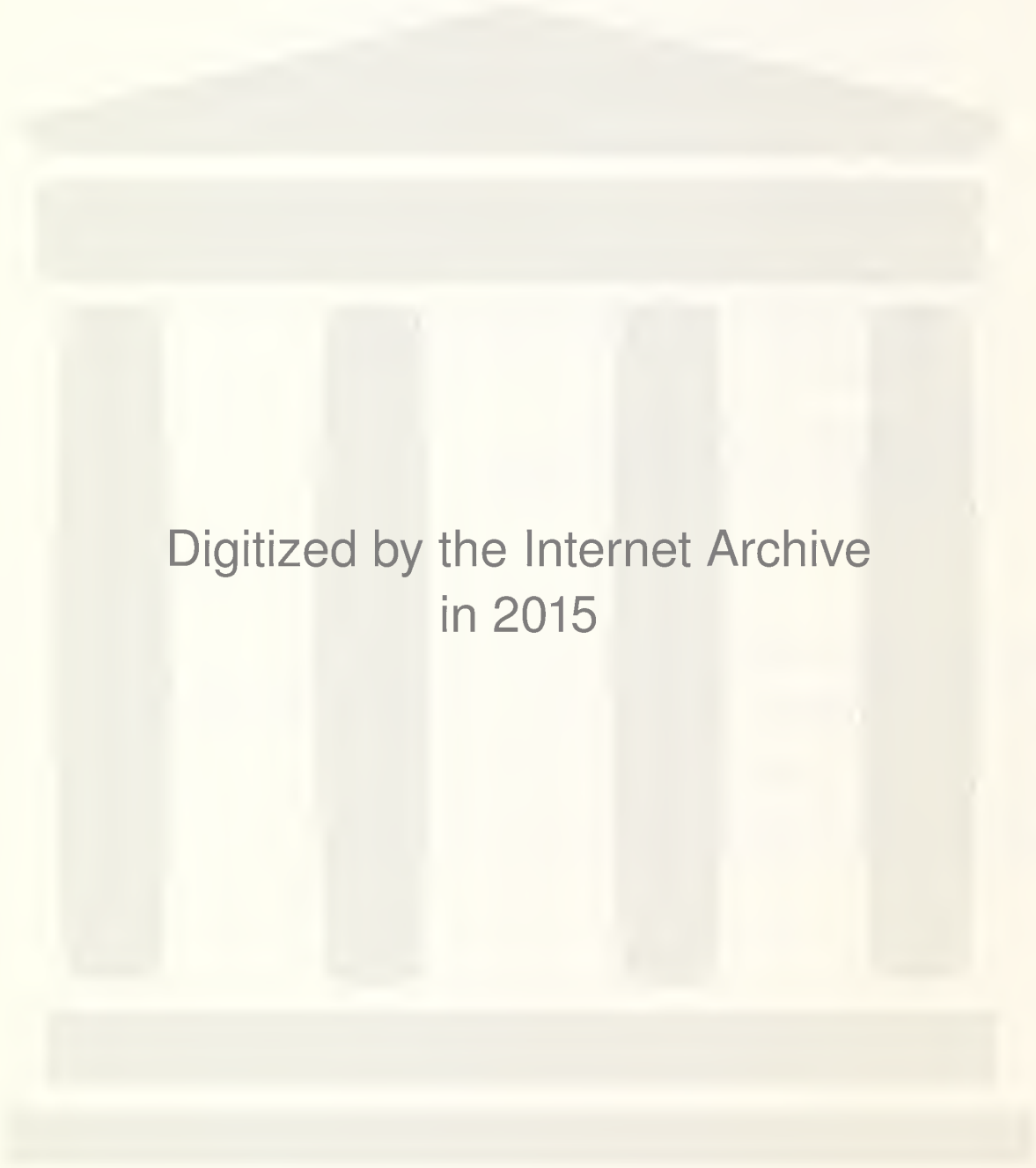
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SUMMARY

This report is the first in a series of five major reports that will be published in conjunction with the Solid Waste Management and Resource Recovery Study for the State of Montana. The primary objective of this study is to determine the feasibility of utilizing the combustible fraction of solid waste as an energy source and to determine the feasibility of recovering secondary materials found in the state's solid waste stream. The study was iniated in July, 1975 and is to be completed in November, 1976.

This report summarizes the population, employment and waste generation characteristics for the State of Montana. The population and employment data was obtained from the State of Montana, Department of Community Affairs. The waste generation data was obtained from detailed investigations of ten waste disposal sites located throughout the state. A solid waste sampling and laboratory testing program was also conducted to determine the general waste composition and combustible characteristics of the solid waste generated in the state.

The population of the State of Montana was 694,409 in 1970 and is expected to increase to 970,770 by 1990. Because of the sparse population, the state's population density is approximately 4 persons per square mile. This ranks 44th in the United States. In 1970 the total state employment was 262,600. This represented an employment to population relationship of approximately 38 percent. The total state

employment is projected to increase approximately 21 percent by 1980 with all industries expected to increase their labor force with the exception of the mining industry.

Based on data obtained from the waste disposal site surveillances and analysis of past waste disposal records, average waste generation rates were developed for the state. The generation rates which were determined applicable for the state are summarized below:

City Population	Waste Generation Rate (lbs./person/day)
Greater than 5,000	5.70
1,000-5,000	3.25
less than 1,000*	2.25

*includes rural population

Based on the generation rates summarized above; it was determined that approximately 590,000 tons of waste will be generated in the state in 1975. This represents an average waste generation rate of 4.28 lbs/person/day. The quantity of waste is expected to increase approximately 36 percent by 1990 to approximately 870,000 tons per year. Through further analysis it was determined that approximately 78 percent of the waste generated in the state could be processed at a resource recovery facility. The remaining 22 percent would consist of demolition, inert and organic type materials which would require disposal regardless of the degree of resource recovery implemented.

To determine the composition of wastes generated throughout the state, a waste separation program was conducted in four Montana cities. Based

on the data obtained from the separation program, the general composition of the municipal solid waste generated throughout the state was predicted as follows:

Waste Type	Waste Composition (Percent by Weight)
Paper	38.2
Plastic	5.8
Yard	11.7
Food	19.3
Glass	8.7
Metals	10.6
Other	5.7
Total	100.0

To determine the general combustible characteristics of solid waste generated within the state, fifty random samples of solid waste were obtained and analyzed using laboratory techniques. The samples were obtained in four Montana cities. Listed below is a summary of the results obtained from the laboratory analysis. As the results indicate, the heat value of solid waste is approximately 5,000 BTU/lb on an as-received basis. In comparison, this represents approximately one-half the heat value of Montana coal on an equivalent BTU basis.

CHARACTERISTIC	AVERAGE PERCENT BY WEIGHT
Moisture content	35.20
Sulfur content	0.19
Ash content	11.30
Heat Value (BTU/lb;as-received)	5039

PART ONE

GENERAL BACKGROUND INFORMATION

A. INTRODUCTION

The primary objective of this project is to determine the feasibility of utilizing the combustible fraction of solid waste as an energy source and to also determine the feasibility of recovering secondary materials found in the state's solid waste stream. Also included in the basic scope of work is the development of solid waste management plans for each of the twelve planning districts in the state. These management plans will indicate which available solid waste disposal method or methods is most economically feasible and environmentally acceptable for each district. A breakdown of the major tasks involved are summarized below:

1. Determine the quantity and composition of solid waste generated throughout the state.
2. Determine potential markets for recoverable type materials found in the solid waste stream.
3. Review alternative technologies for the energy and materials recovery of solid waste.
4. Develop solid waste facility and management plans for the state by planning region.
5. Determine alternative organizational and financial strategies which will be necessary to implement the recommended solid waste management plans.

This study was initiated in June, 1975 with the development of a detailed work program. The final report, which will summarize all report findings, conclusions and recommendations, will be completed and published in November, 1976.

In addition to state funds, financial assistance for the project was provided by the Environmental Protection Agency (E.P.A.). The grant from the E.P.A. was primarily directed towards the development of a comprehensive solid waste management plan for the coal impact areas of Montana. This area includes the ten counties in Southeastern Montana which comprise planning districts 3 and 7.

B. PROJECT MANAGEMENT AND EXECUTION

1. Project Management. The successful execution and completion of this project is dependent upon continuous coordinated input from the contracting entity, the State of Montana, and from the consultant team of Henningson, Durham & Richardson, Inc. The state, operating through its Department of Health and Environmental Sciences, is responsible for the day-to-day detailed technical analysis required to meet the objectives of the study. Other study participants include a technical steering committee. The interrelated roles of the study participants are as follows:

The State of Montana Department of Health and Environmental Sciences provides overall project management, are responsible for the review of study findings as they are developed, and are responsible for scheduling and coordinating meetings between the study team and the various review committees and agencies.

The consultant team is responsible for program development, and thence for all detailed investigations required by the study program. The

consultant is responsible for all engineering evaluations and cost estimates and for the recommendations contained in this study.

The technical steering committee is presently an eighteen (18) member group comprised of business and civic leaders, elected officials and representatives of interested environmental and industrial groups. The primary responsibility of the committee is to provide technical review of all project findings and progress. It is anticipated a minimum of six meetings will be held throughout the course of the project.

To keep the public abreast of the progress and findings of the study, public informational meetings will be held at strategic locations throughout the state during the course of the study. The dates and locations will be determined as the study progresses.

2. Work Program. In June, 1975, a detailed work program of the major study elements, tasks and subtasks was developed. From this a critical path was developed to assist in project management and execution. Following is an abbreviated outline of the work program:

WORK PROGRAM

PART ONE: PROJECT DEVELOPMENT AND MANAGEMENT

Task 1100: Develop Preliminary Project Plan
Task 1200: Project Management
Task 1300: Develop and Conduct Public Information and Involvement Program

PART TWO: ASSEMBLE BASIC DATA

Task 2100: Assemble Available Population and Employment Data
Task 2200: Determine Present Waste Generation and Project Future Quantities

Task 2300: Identify and Evaluate Special Potentially Recoverable Wastes
Task 2400: Prepare Population, Employment and Waste Generation Report

PART THREE: ANALYZE MARKETS

Task 3100: Identify and Evaluate Potential Markets for Utilizing Solid Waste as an Energy Source
Task 3200: Identify and Evaluate Potential Markets for Raw or Recoverable Waste Components
Task 3300: Prepare Energy and Materials Market Report

PART FOUR: EVALUATE APPLICABLE ALTERNATIVE TECHNOLOGIES FOR ENERGY AND MATERIALS RECOVERY

Task 4100: Determine Process and Equipment Requirements to Accomplish Secondary Materials Recovery and Waste Utilization for Potential Energy User
Task 4200: Determine Process and Equipment Requirements for producing Solid Waste compost for use as a Soil Conditioner
Task 4300: Prepare alternative processes report

PART FIVE: DEVELOP A SOLID WASTE FACILITIES PLAN BY DISTRICT FOR EACH OF THE FIVE PLANNING REGIONS

Task 5100: Develop Preliminary Solid Waste Transfer, Processing and Utilization Facilities Location Plan
Task 5200: Interim Review of Alternatives
Task 5300: Refine Preliminary Facilities Designs and Cost Estimates
Task 5400: Prepare Five Planning Region Facility Plans

PART SIX: EVALUATE ENVIRONMENTAL CONCERNS

Task 6100: Review Technical Environmental Considerations

PART SEVEN: DEVELOP AND EVALUATE ALTERNATIVE IMPLEMENTATION AND ORGANIZATIONAL STRATEGIES FOR ENERGY AND RESOURCES RECOVERY

Task 7100: Determine Legislative, Political and Contractural Impediments and Requirements for Implementation of the Energy and Resources Recovery Plan
Task 7200: Develop Alternative Organization and Financing Strategies for Implementation
Task 7300: Prepare Implementation Report

PART EIGHT: PREPARE FINAL SOLID WASTE MANAGEMENT PLAN FOR EACH PLANNING REGION

Task 8100: Develop Solid Waste Management Plan

PART NINE: PREPARE FINAL SUMMARY REPORT

Task 9100: Prepare Draft Summary Report
Task 9200: Finalize Summary Report

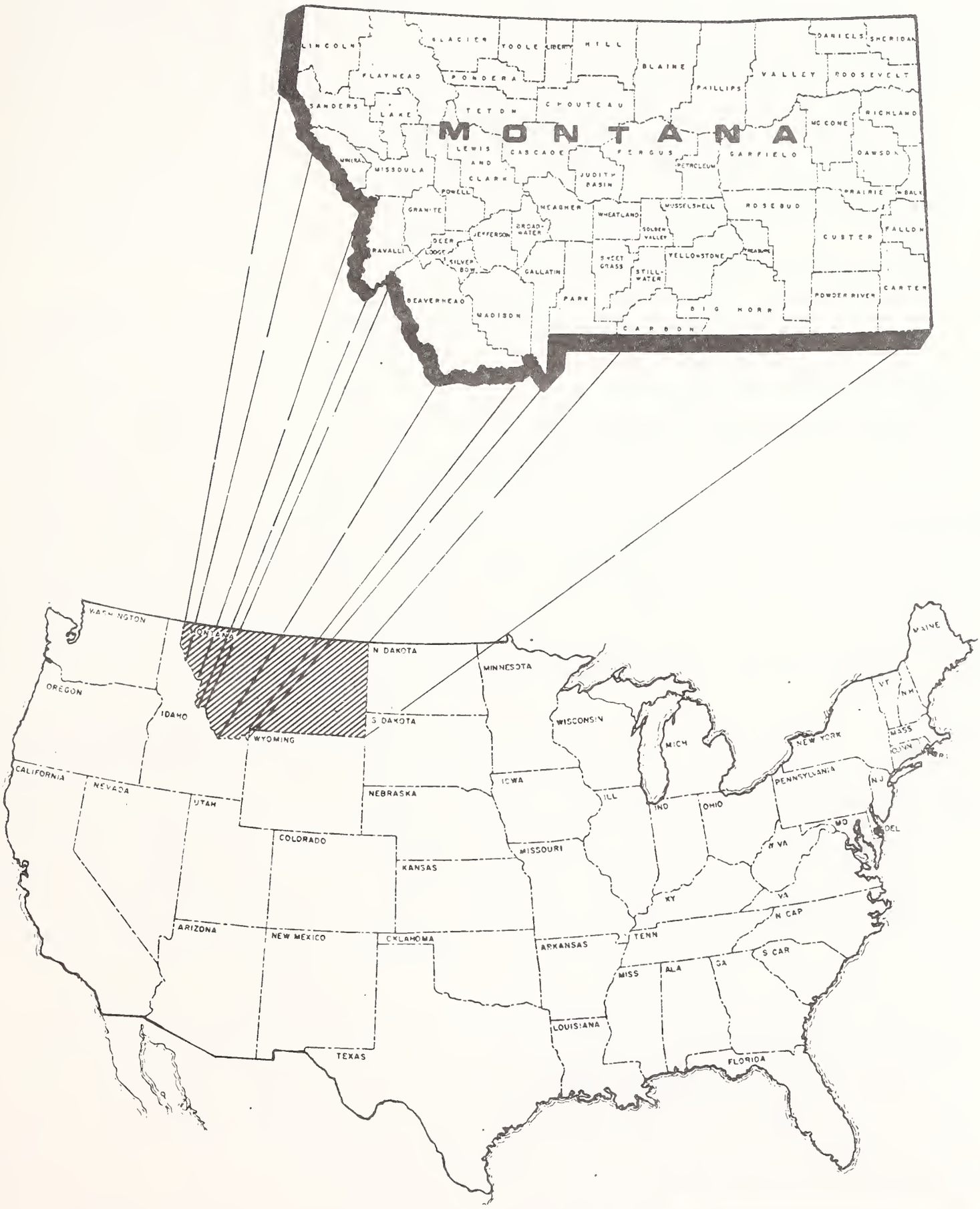
3. Reporting Schedule. During the progress of the study, five major reports will be filed. This report is the first of the series. For each report a draft copy will be submitted for review by selected steering and public response committees and by interested state, county and city officials. Comments for each report will then be reviewed and incorporated into final reports. Listed below are the titles of the five major reports and the anticipated dates each will be filed.:

		Draft	Final
1.	Population, Employment and Waste Generation Report	December, 1975	January, 1976
2.	Energy and Material Market Report	February, 1976	March, 1976
3.	Alternative Processes Report	April, 1976	May, 1976
4.	Implementation and Financial Report	June, 1976	July, 1976
5.	Regional Management Plans	July, 1976	August, 1976

At the completion of the study all findings and conclusions from each of the five reports will be summarized into a Final Summary Report. The summary report will include a detailed analysis of the conclusions and recommendations of the study addressing the technical, environmental and economic feasibility of recovering energy and other marketable resources from the solid waste generated in Montana.

C. THE STUDY AREA

1. General. The study area, as shown in Figure I-1, includes the entire State of Montana. Because of the state's large size, fourth largest in the United States, and its comparitively low population, 694,409, according to the 1970 census date; the population density of four persons per square mile ranks 44th in the United States.



LOCATION MAP

FIGURE I - 1

2. Geography. The geography varies considerably within the state. The western half is predominately mountainous with elevations of peaks in excess of 10,000 feet, whereas, the eastern half is predominately rolling plains. The state is abundant with fresh water streams and lakes; the most famous being the Missouri River which emerges from the southcentral portion of the state.

3. Climate. Weather conditions in Montana are very extreme and unpredictable, however, average weather conditions compare quite reasonably with other mid-continent states. The average monthly temperatures range from 69 degrees F in July to 17 degrees F in January. Precipitation varies considerably over the state. Average annual precipitation varies from 8-15 inches per year in the eastern part of the state to 15-25 inches per year in the west. Annual snowfall also varies from 30-40 inches in the east to in excess of 100 inches in the west.

4. Transportation. The state has a good highway transportation system with over 78,000 miles of paved, gravel and dirt highways criss-crossing the state. The state is bisected by I-15, a major north-south route, and I-90, a major east-west route. Five railroads, six buslines and four airlines also serve the state.

5. Economic Background. With more than 65 million acres of land in farms and ranches, agriculture is the leading industry in the state. In recent years incomes from crops, livestock and agricultural products have exceeded $700 million. The state is one of the leading wheat producing areas in the nation with production usually exceeding

100 million bushels annually. Other major crops include: barley, oats, sugar beets, corn and hay. With over 3,000 beef cattle per year, Montana ranks 7th in national beef production. Over one million sheep are also found on the farms and ranches in the state.

Montana's second leading industry is mining and mineral production. The value of mineral products is presently over $300 million annually. Principal materials produced include: petroleum, copper, sand and gravel, and cement. Other metals and minerals include: silver, zinc lead, gold, manganese ore, chromite concentrates, fluorspar, vermiculite, phosphate, phosphorus, and talc. Most important non-metallic minerals include: oil, gas and coal, all of which are increasing in production. Copper, oil and natural gas account for about two-thirds of the income from minerals. Montana ranks 11th among states in oil production.

The third largest industry in the state is tourism. Montana annually attracts an estimated 5 million visitors. Tourist expenditures are estimated to be approximately $180 million per year.

Manufacturing also plays a large role in the Montana economic picture. The most important manufacturing establihsments process natural resources of the state. These include: flour mills which grind high protein wheat into flour, factories which process sugar beets into sugar, cannaries which preserve Montana cherries, peas, beans, and apples and lumber, plywood and pulp mills which process the wood products cut from the state's 22.4 million acres of timber.

D. EXISTING SOLID WASTE MANAGEMENT SYSTEM

1. Solid Waste Laws and Regulations. Under the present Montana state solid waste disposal laws and rules all refuse disposal areas must be licensed by a local county or district board of health. Prior to the issuance of a waste disposal permit, the State Department of Health and Environmental Sciences must also inspect and approve the site. Disposing of any garbage, rubbish or refuse in any place except as permitted under the state disposal law is prohibited. The state law does not, however, prohibit any person from disposing of his own garbage, rubbish or refuse upon his own land as long as such disposal does not create a nuisance.

The State Department of Health and Environmental Sciences have established three classifications for refuse disposal sites. A summary of the three classifications are listed below:

(a) CLASS I sites may accept all groups of waste. Class I sites shall not allow discharge of these materials or their by-products to ground or surface waters. These sites must either confine the wastes to the disposal site with no likelihood that the wastes will escape or they must be situated in a location where the leachate from the wastes can only percolate into underlying formations which have no hydraulic continuity with usable waters.

(b) Class II sites are suitable for accepting decomposable and organic materials, wood and demolition materials, and digested wastewater treatment sludges. The site must provide for separation of these type materials from underlying or adjacent usable water. The distance of the required separation is established on a case-by-case basis, considering factors such as terrain, type of underlying soil formations, and natural quality of the groundwater.

(c) Class III sites are suitable for accepting only inert type materials excluding industrial mineral wastes. The site may contain water such as in marshy areas, deep gravel pits which contain exposed groundwater, or areas which may be periodically flooded, such as along stream flood plains. Class III sites shall not be located on the banks or in a live or ephemeral stream.

The state disposal laws and regulations, section 69-6001 also gives the county commissioners throughout the state the authority to create a solid waste district for the purpose of collection and/or disposal of refuse. The purpose of this law is to protect the public against the spread of disease, air pollution and water pollution in areas of the state where improper storage, collection and disposal of refuse is declared to be a significant health and safety hazard. Cities and towns maybe included in the district if approved by the city and town councils.

2. Existing Disposal System. As of December, 1974, 76 percent of the population throughout the state received proper refuse disposal. Only 38 percent of the communities which disposed of their refuse, however, had proper operational disposal sites. One hundred-seventy-two (82 percent) of the communities with non-proper operational disposal sites had populations under 1,000 while only 52 (41 percent) of the communities with proper operational disposal sites had populations less than 1,000.

As of December, 1974 there were only 14 disposal sites with known operating licenses. This was primarily due to the procedure required to obtain a license. Each disposal site must complete a license application form and then forward the form to the State Department of Health and Environmental Sciences for approval. The Department of Health and Environmental Sciences then returns the application to the local board of health, if approved, and the local board of health issues the license. The procedure for obtaining an operating license

has been reviewed and greatly expediated in the past 12 months. Thus it is anticipated that several more landfills will be licensed within the next one-year period.

To dispose of junked vehicles, the state implemented a junk vehicle disposal program in July, 1973. The program is financed by: 1.The sale of junk vehicles; 2.a $2.00 fee levied on all vehicles registered in the state;3.a wrecking facility licensing fee and 4.a title transfer fee for all junked vehicles. The program is unique in that funds are provided to counties for planning as well as operation. Each county is then left to determine the type of program it feels best fits the needs of the citizens.

The program stipulates that each junk vehicle graveyard must have a minimum of 2 acres of land and be properly shielded from public view. After each graveyard has accumulated 200 vehicles a contract is obtained with a scrap dealer to dispose of the vehicles. The profit obtained from the vehicles is then placed in the state's junk vehicle operating budget.

Presently there are 127 licensed motor vehicle wrecking facilities in the state. Since the initiation of the program, these wrecking facilities have removed over 10,000 junked vehicles. This represents junk vehicles which have been removed from 20 counties. The majority of the vehicles removed are initially crushed and transported to a shredding plant. The shredded vehicles are then processed into fist-sized scrap which go to foundaries to make new steel.

PART TWO

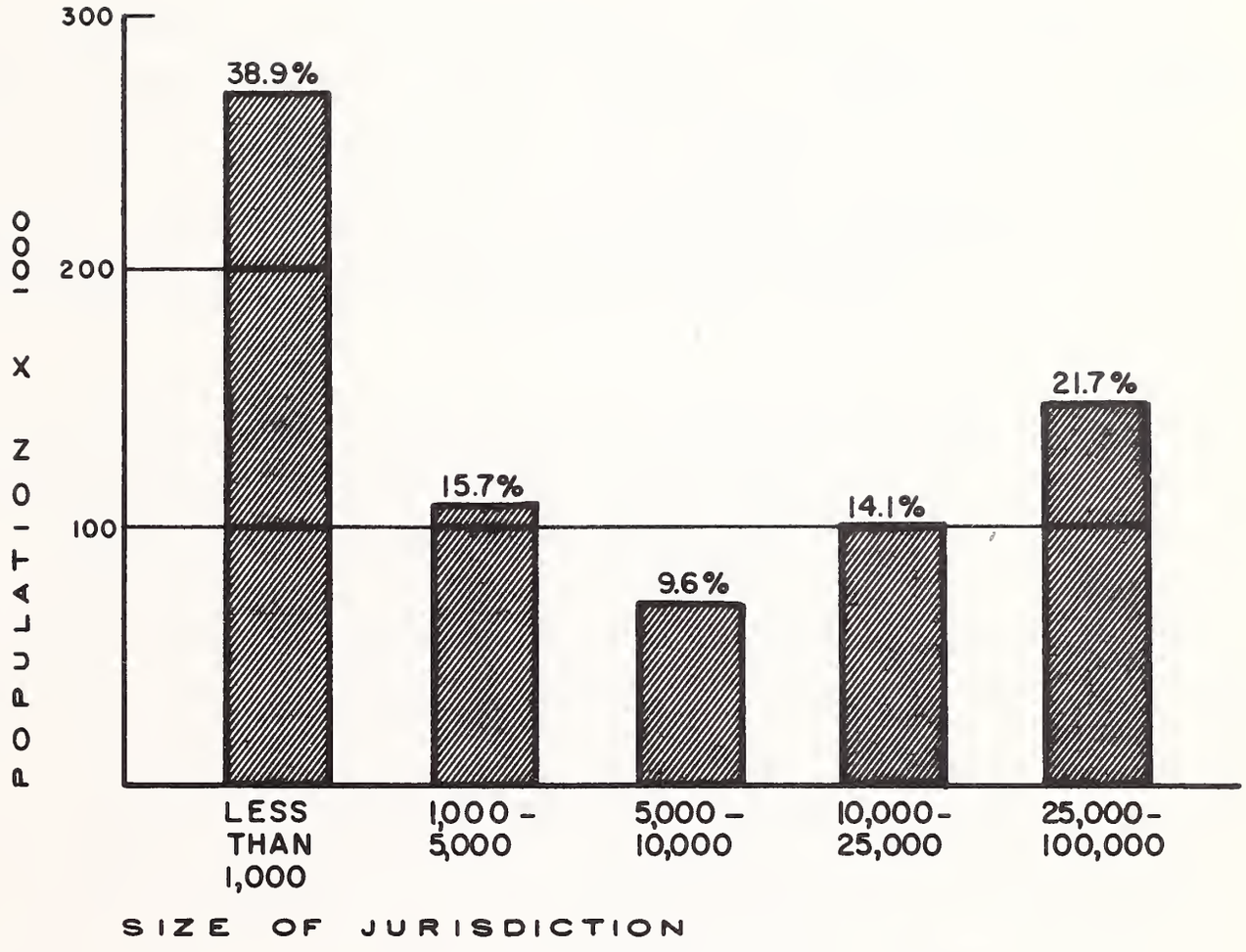
POPULATION AND EMPLOYMENT

A. POPULATION

An analysis of the past, present and future population trends of an area are a necessary prerequisite to planning future solid waste facilities. The quantity and characteristics of solid wastes for any given area are closely related to population as well as employment.

According to census data the state population in 1970 was 694,409. Figure II-1 depicts the breakdown of the population by jurisdictional size. As the figure shows approximately 270,000 or 39 percent of the population was comprised of people living in cities with populations less than 1000 or in unincorporated areas. For the purpose of this report the people living within this classification will be considered rural. The jurisdictional size comprising the second largest population was all cities larger than 25,000. These size cities contributed approximately 22 percent of the total state population.

To predict future quantities of solid waste generated in the state, population projections through the year 1990 were obtained from the State of Montana, Division of Research and Informational Systems, Department of Community Affairs. The projections were developed using the CEMS (Census-Estimate-Migration Survival) model. The model utilizes current census migration estimates to develop a migration rate which is used with migration survival methodology to project population by age and sex. A detailed explanation of the



NOTE: DATA BASED ON 1970 CENSUS DATA

DISTRIBUTION OF STATE POPULATION

FIGURE II - 1

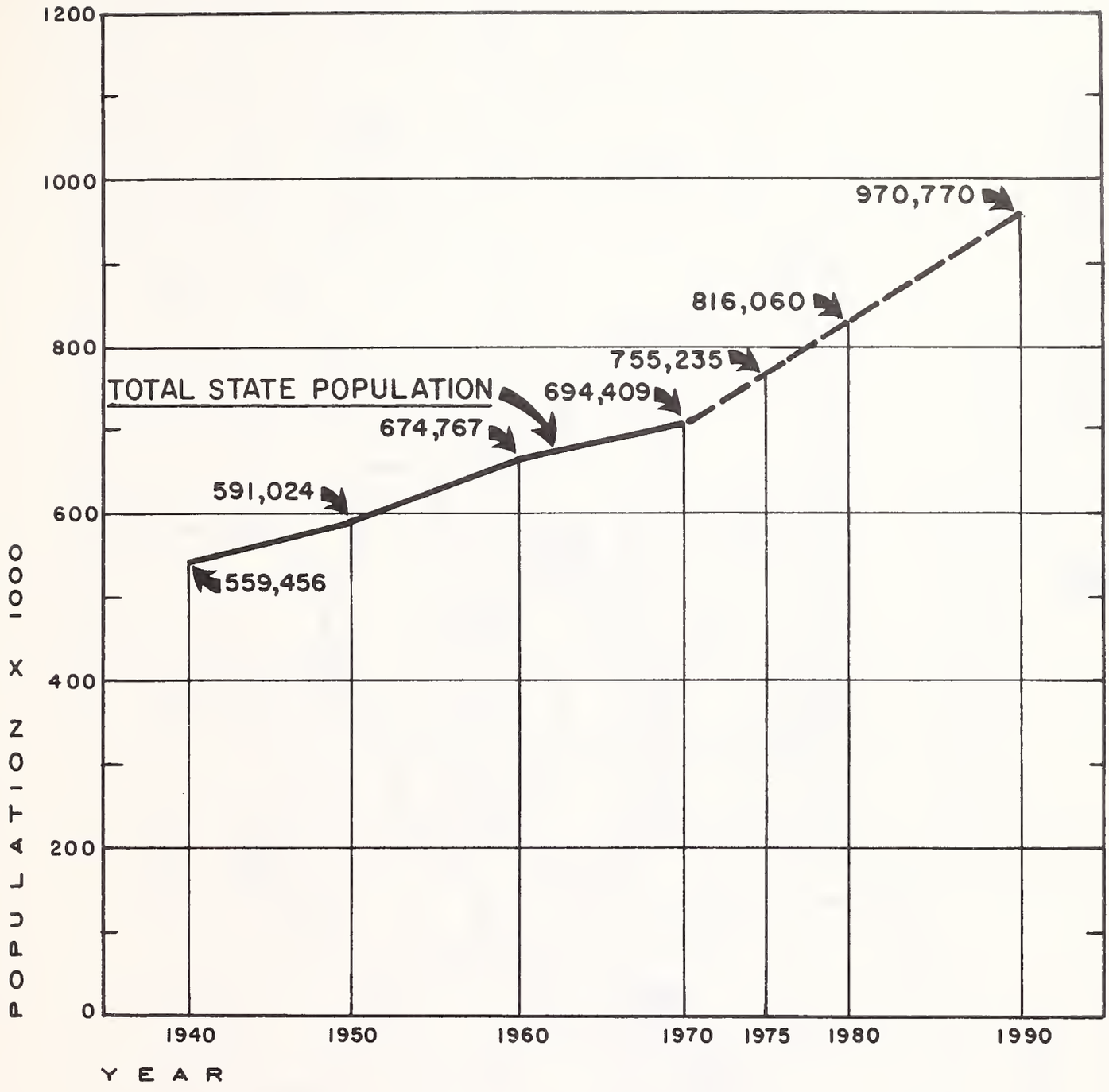
method utilized to project the populations and a list of the population projections by county for each five year interval through 1990 are tabulated in Appendix A.

The past and projected state populations are depicted in Figure II-2. As the figure shows,the total state population is expected to increase to 970,770 by 1990. This represents approximately a 2 percent per year increase. This compares with an average of approximately .75 percent increase per year for the past 20 year period.

To compare the variance in population distribution throughout the state, the estimated 1975 and projected 1990 populations were analyzed by planning region. Figures II-3 and II-4 respectively show the locations of each planning region in the state and their respective populations. As depicted in Figure II-4, Planning Region I, which includes the eastern one-third of the state, has the lowest population of the five regions. The remainder of the regions, which have comparatively similar populations, have approximately 50 to 75 percent higher populations than Region I. The figure also indicates that Region II through V will increase in population approximately 33 percent in the next 15 years where Region I will increase a nominal 10 percent.

B. EMPLOYMENT

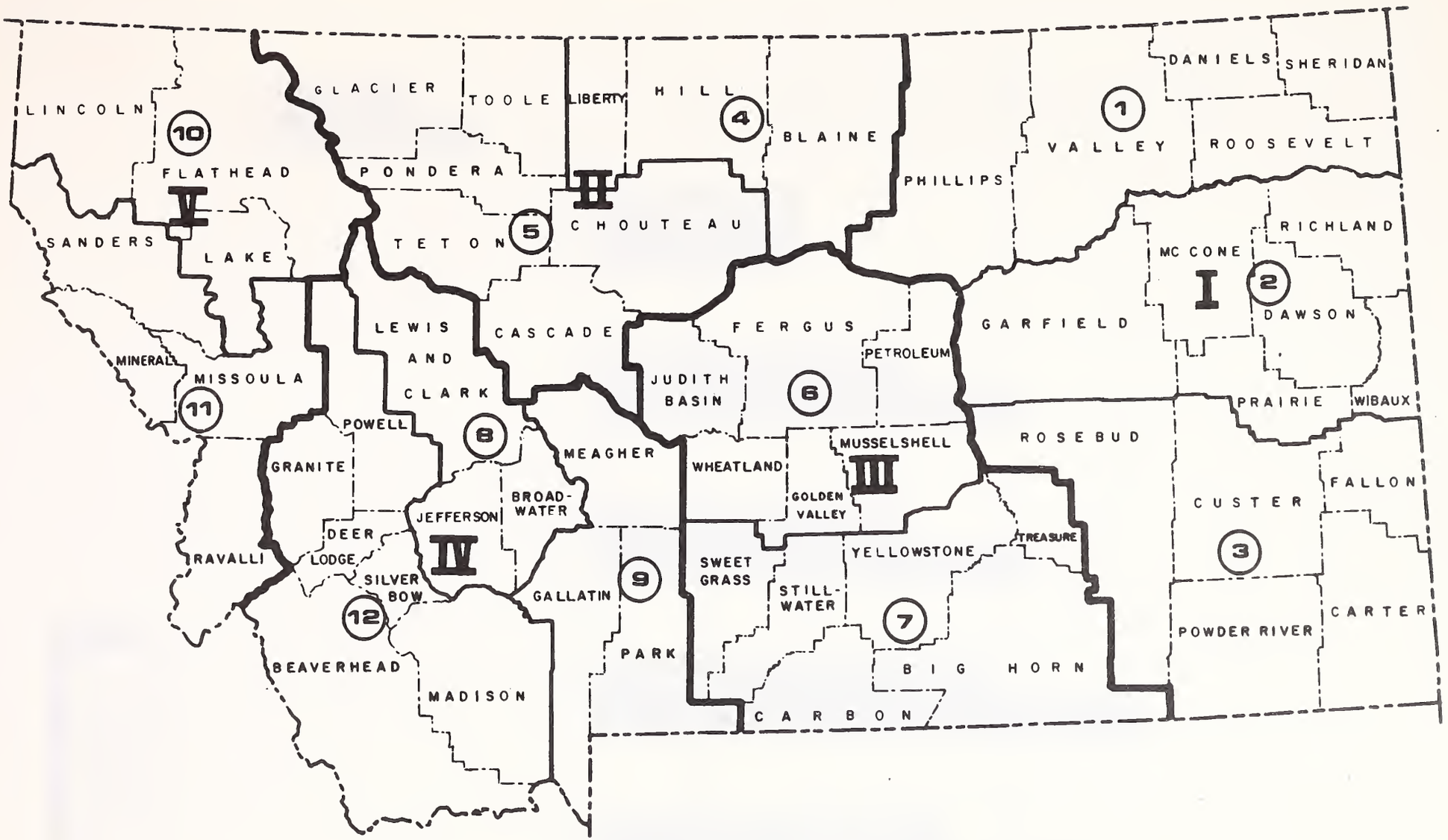
In addition to population characteristics, employment also affects the solid waste generagion of an area. Generally as the population-employment ratio (total number employed ÷ total population) in an



NOTE: TOTAL STATE PROJECTION DETERMINED FROM CEMS MODEL

STATE OF MONTANA POPULATION PROJECTIONS

FIGURE II - 2

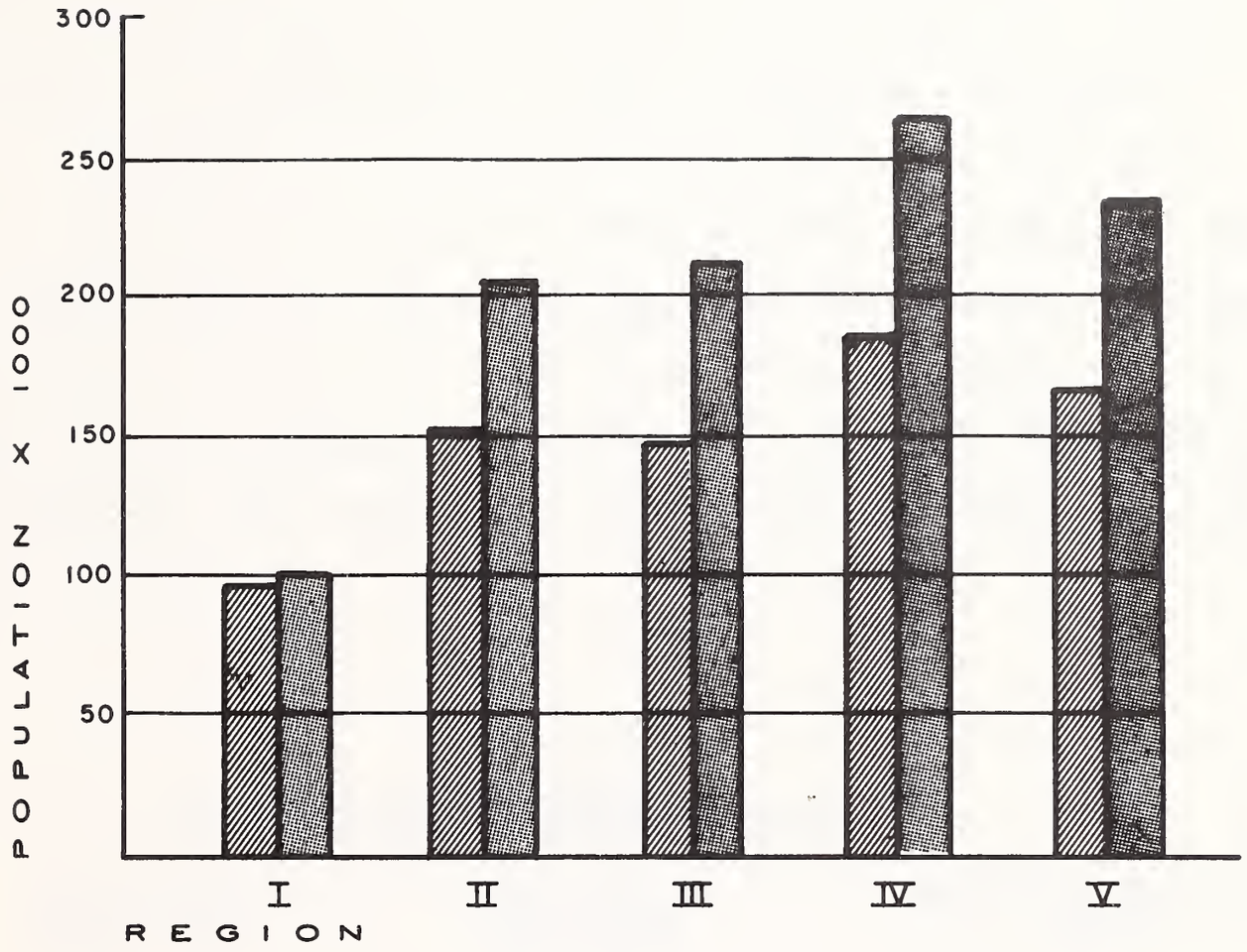


I – REGION NO. & BOUNDARY

5 – DISTRICT NO. & BOUNDARY

STATE OF MONTANA
PLANNING DISTRICTS & REGIONS

FIGURE II - 3



POPULATION BY PLANNING REGION

FIGURE II - 4

area increases, the per capita generation of wastes also increases. This is due to the increased quantity of waste resulting from the increased commercial and industrial activity.

Past and projected population-employment for the state was analyzed to determine if any employment trends in the state are apparent. Table II-1 depicts the 1960 and 1970 state population and employment data and also the estimated 1980 population and employment data. As the table shows, the state population-employment ratio increased approximately 8 percent between 1960 and 1970. The table also shows that the ratio is expected to increase only 2 percent within the next 10 year period. This indicates a relatively stable employment base for the state in the future.

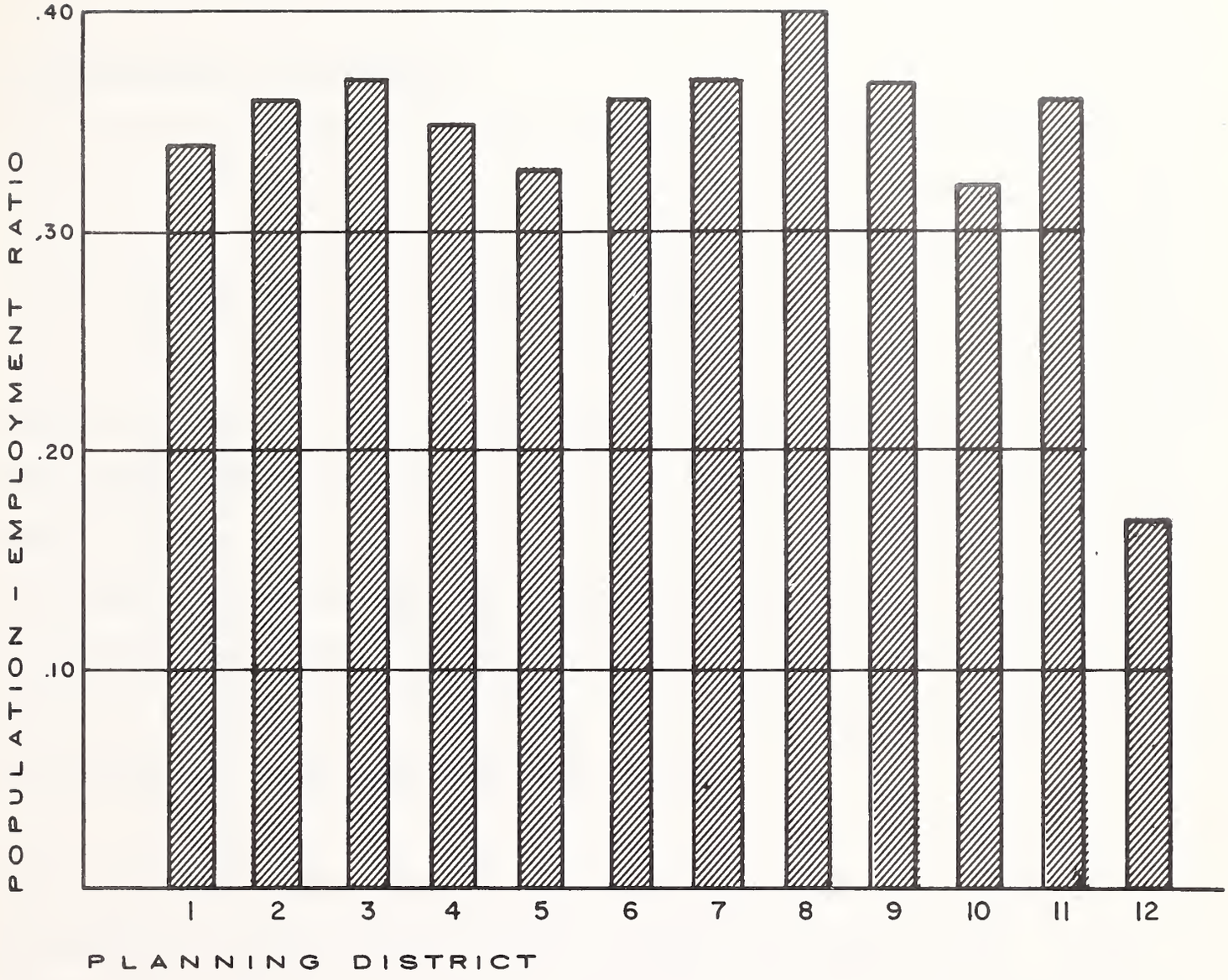
TABLE II-1
STATE POPULATION-EMPLOYMENT DATA

Year	Total State Population	Total State Employment	Population-Employment Ratio
1960	674,767	236,000	.350
1970	694,409	262,600	.378
*1980	816,060	314,000	.385

*Data obtained from the Montana State Employment Service

A more detailed analysis of the state's future employment outlook indicates approximately a 21 percent increase in the labor force within the next 10 year period. It has been predicted that all industrial types in the state will increase its labor force with the exception of the mining industry.

To evaluate the population-employment variance throughout the state, population-employment ratios were evaluated for each of the state's twelve (12) planning districts. Figure II-3 shows the location of each district. Figure II-5 summarizes the ratios for each district. The data depicted was obtained from the 1970 census. As can be seen from the figure the population-employment ratios for each district with the exception of district 12 are relatively constant. The population-employment ratio in District 12, which includes the cities of Butte and Anaconda, is lower because of the decreased labor force required by the Anaconda Copper Company in recent years. The relatively constant population-employment ratios throughout the state indicate that the generation of solid waste on a per capita basis should be fairly uniform throughout the state.



NOTE: POPULATION & EMPLOYMENT DATA
OBTAINED FROM 1970 CENSUS

POPULATION EMPLOYMENT RELATIONSHIP

FIGURE II - 5

PART THREE

SOLID WASTE QUANTITIES

A. PHILOSOPHY AND APPROACH

The technical design of facility components and the economic and technical evaluations of alternative solid waste processing, energy and materials recovery and disposal systems are all based on predictions of solid waste quantities and composition. This is especially true for this project which will evaluate, in addition to the existing disposal method of landfilling, sophisticated complexes of mechanical facilities. Where sanitary landfilling can handle substantial peak loads of waste with relative ease and can continue functioning, complex mechanical facilities have definite load variance capabilities. It is therefore highly important that the volume and composition of the solid waste load be determined to the best degree possible prior to the design and construction of facilities.

There are other valid reasons for being as precise as possible in determining projected solid waste volumes and compositions. These concern the materials and energy which may be recovered and marketed. It is necessary to predict quantities of solid waste so that specific quantities of marketable materials can be projected. These projected quantities can then be discussed with potential users and the potential revenues for the marketable materials can be determined.

Unfortunately, the basic data required for precise reliable predictions is often not available. This is especially true for the State

of Montana due to the lack of available solid waste disposal records at the majority of the state's waste disposal sites. The problem is further compounded by the diverse methods by which records are maintained and the individual purposes for which records are kept; all of which contribute to the general lack of an orderly system of available, reliable data.

The technique which has been used successfully to project waste quantities and composition for other studies has been to conduct surveillances at off-load points for which the service area could be reliably defined. Sometimes the service areas have included entire metropolitan regions; other times they have just included segments of metro areas or just single communities. In all cases, the measured waste generation has been correlated with other reliable area data. Generally, population and employment have shown the best correlation.

At the outset of this study, it was recognized that little waste generation data in the state is available. Thus, it was the consensus of the State Solid Waste Bureau and the consultant that investigations should be conducted throughout the state to determine precise waste generation and composition data for the state. This data could then be compared to similar type data in other parts of the country to determine its validity and the need for adjustment.

The general approach for establishing waste generation rates on a lbs. per capita basis for this study was as follows:

1. Population and employment data for the state was obtained from the State Department of Community Affairs and the major cities so that solid waste quantities could be related to present and projec-

ted population and employment.

2. In cooperation with the State Solid Waste Bureau, ten disposal sites were selected which represented a cross-section of the population and waste generation within the state. It was important during the selection of the ten sites that the population contributing waste to each site was well defined so that the quantity of waste received at each site could be divided by the estimated contributing population to determine corresponding waste generation rates.

3. Available past solid waste disposal data was collected for each of the selected disposal sites.

4. Surveillances were conducted for a one-week period at each of the selected disposal sites such that waste type and quantity data could be obtained.

5. The surveillance data for each disposal site was compared to existing waste disposal data and adjusted where necessary to reflect seasonal quantity and composition variations.

6. The adjusted waste data for each site was interfaced with population data to determine waste generation rates for the various cities and major jurisdictional entities contributing waste to each facility.

7. The various waste generation rates determined from the surveillances were then analyzed and average waste generation rates which reflect the waste generation characteristics in the State of Montana were determined.

B. DEVELOPMENT OF WASTE GENERATION RATES

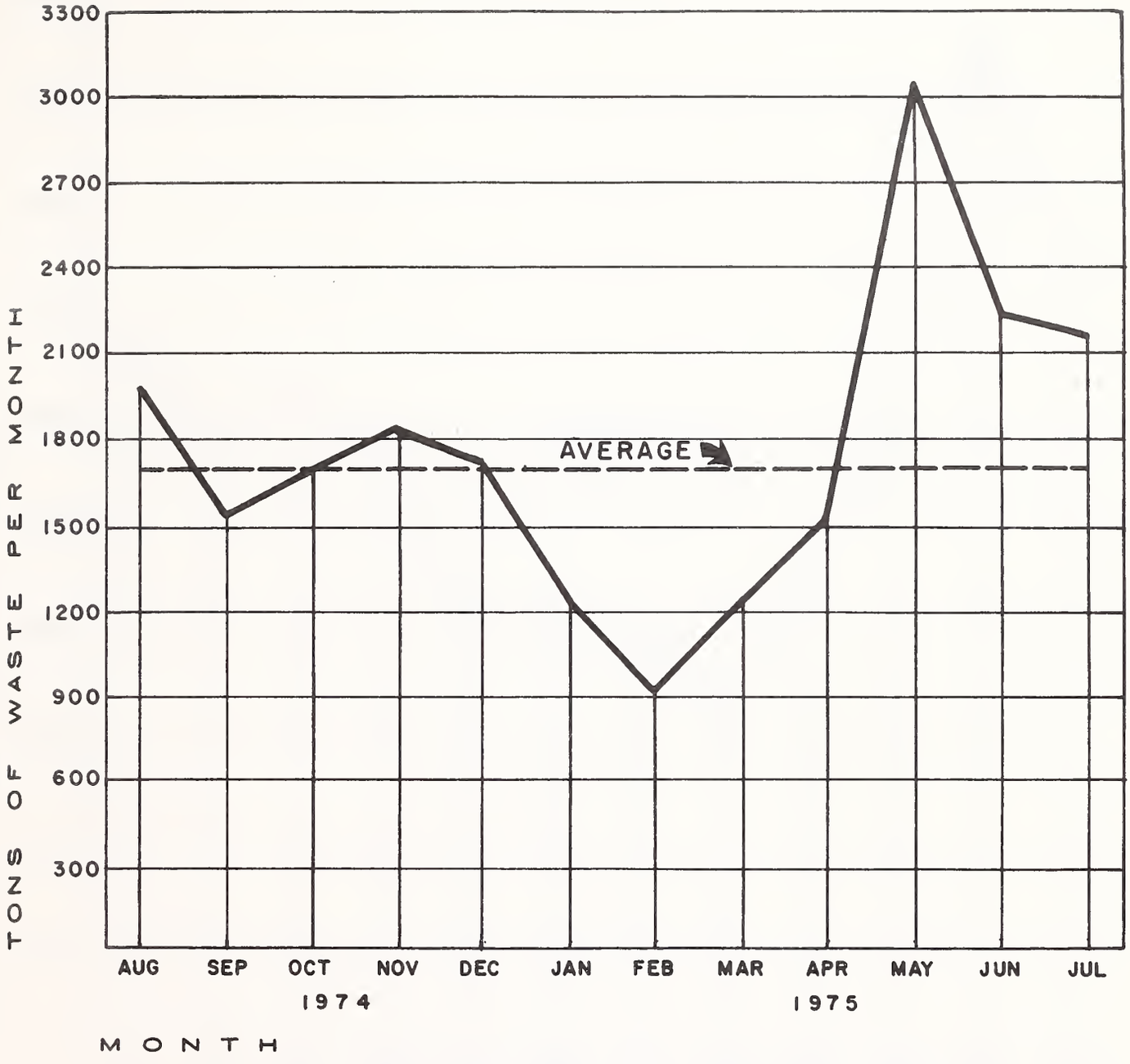
1. General. From the consultant's experience and from studies completed by various governmental groups, it has been determined that the generation rate per capita varies with population density. Large urban areas generate a high per capita rate because of the industrial and commercial wastes. Rural areas with little or no commercial or industrial activity generate relatively low amounts of refuse. Such solid wastes usually consist of only household wastes. Small towns generally have some commercial wastes but very little industrial wastes. An analysis of the waste generation data which was obtained in the State of Montana for this study illustrates this fact very well. This data is summarized herein.

2. Analysis of Existing Records. To obtain the estimated quantities

of waste generated throughout the state and thus the determination of waste generation rates, the disposal records of several landfills were analyzed. It was determined that only the cities of Helena and Great Falls have scales and thus accurate waste disposal records. From an analysis of both cities disposal facility records it was determined that approximately 21,000 tons per year of waste is being disposed of in Helena. This compares to approximately 68,000 tons per year in Great Falls. A detailed analysis of the corresponding waste generation rates and waste composition for Great Falls and Helena is discussed in Section 3 of this chapter.

An analysis of the data obtained from the Helena and Great Falls disposal sites indicates a considerable variance between waste generation from month to month. Figures III-1 and III-2 respectively depict the total solid waste quantities received at the Helena and Great Falls disposal sites by month for the past one year period. In both cities a distinct waste generation peak of 60-80 percent above average occurred during the month of May. Correspondingly a peak of approximately 50 percent below average occurred during the month of February in both cities. The figures also indicate that during the months of August-October waste generation appears to fluctuate very little from the monthly average in both cities. From the consultant's experience in past studies this monthly variance in waste generation is typical throughout the country and can be expected in most Montana cities.

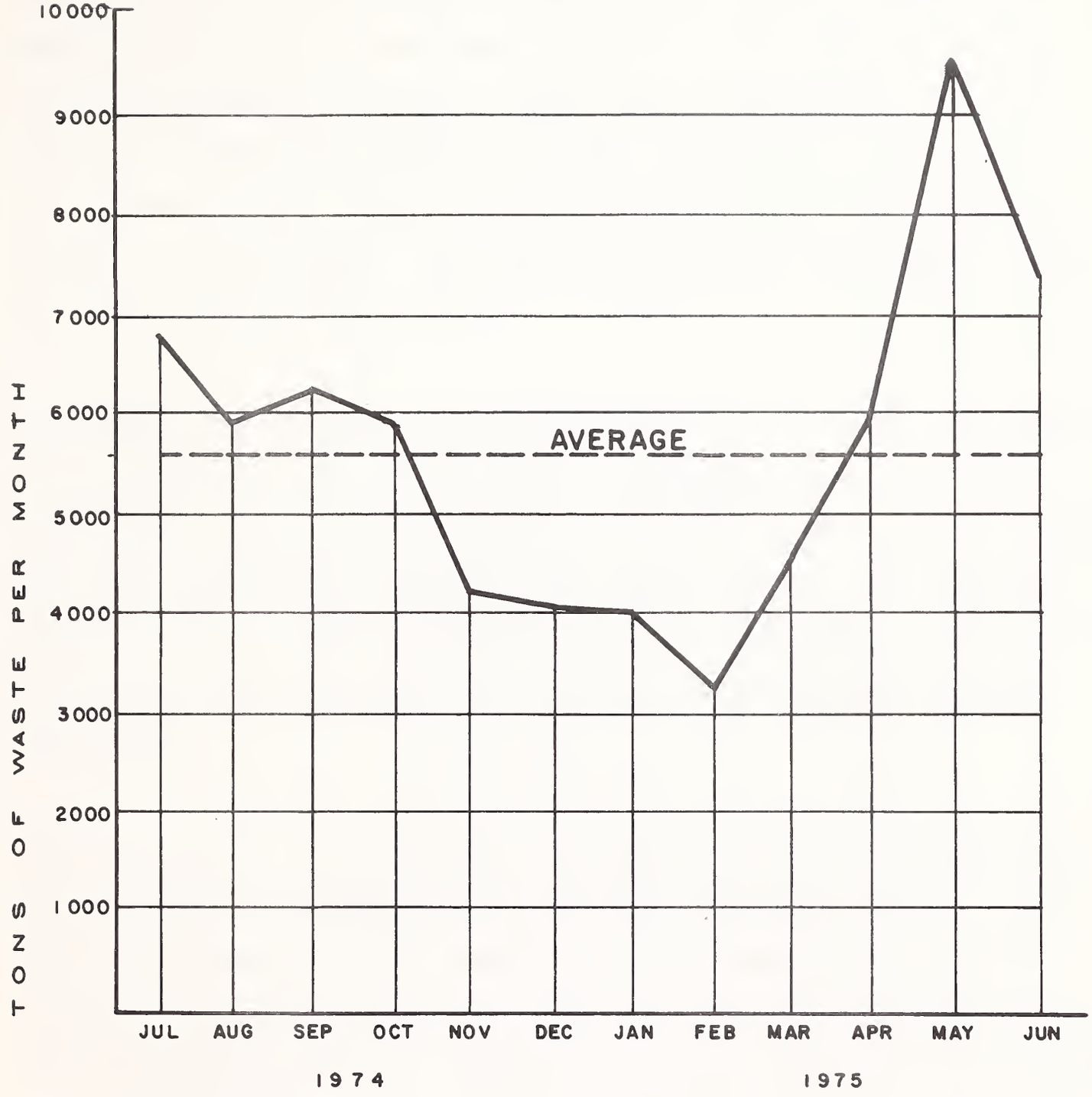
3. Analysis of Landfill Surveillances. As was stated previously, available solid waste generation and past waste disposal



NOTE : DATA OBTAINED FROM CITY OF HELENA

SOLID WASTE SEASONAL VARIATION
HELENA, MONTANA

FIGURE III - 1



NOTE: DATA OBTAINED FROM CITY OF GT. FALLS

SOLID WASTE SEASONAL VARIATION GREAT FALLS, MONTANA

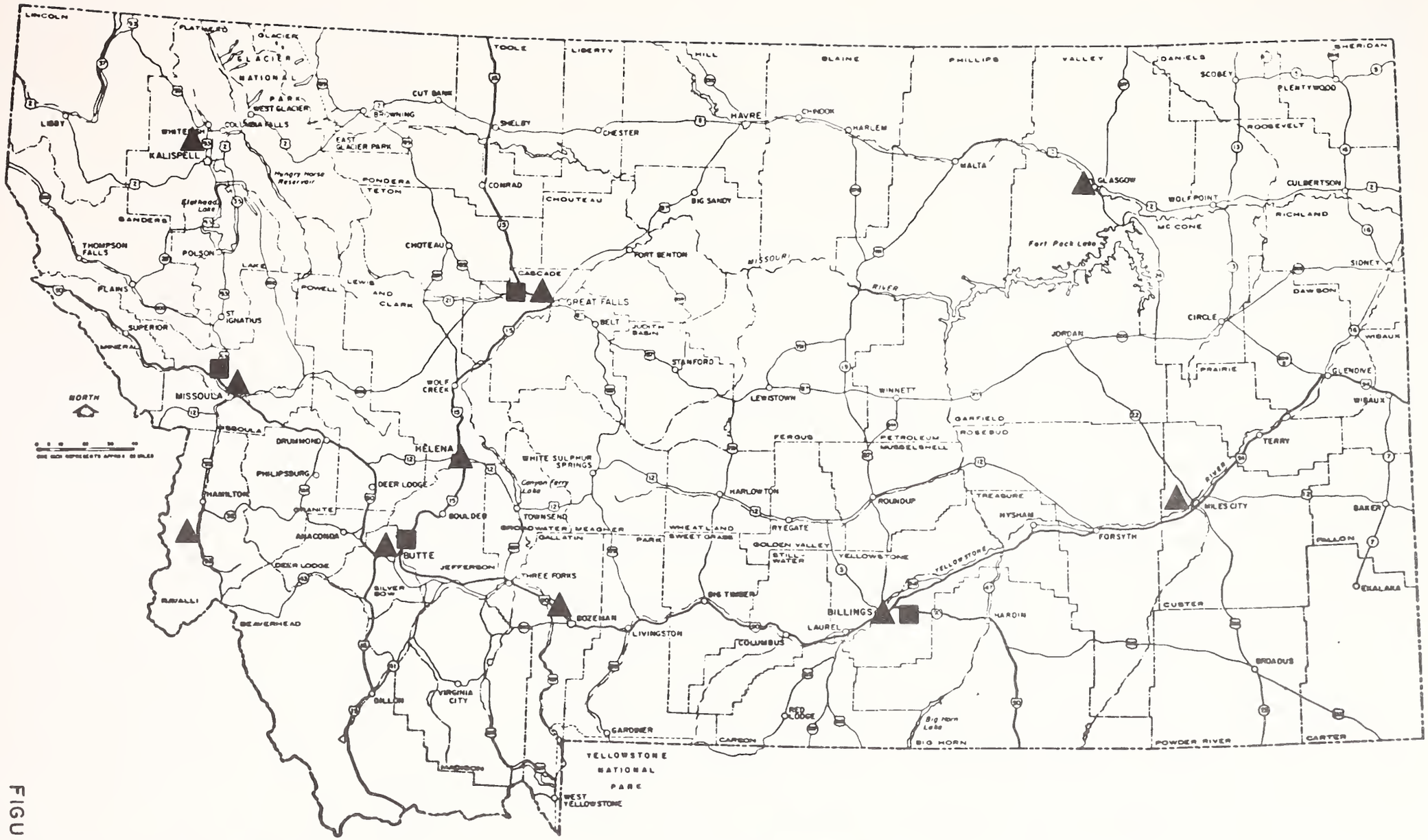
FIGURE III - 2

data in the state is very scarce. Thus, surveillances were conducted at ten predetermined disposal sites located throughout the state. Figure III-3 shows the location of each surveillance. As will be discussed in detail in Part Four of this report, a solid waste hand-separation program was also conducted at four of the ten disposal sites to determine the composition of the wastes generated in those cities. The locations of these four disposal sites are also shown in Figure III-3.

The primary objective of each surveillance was to obtain the quantities, type and origin of the wastes disposed of such that waste generation rates could be determined for the various jurisdictional entities contributing waste to each disposal site. The secondary objective was to obtain data which could be utilized to determine sizing and design criteria for future alternative waste disposal facilities.

Each surveillance was conducted continuously for a one-week period for the entire time the disposal site was receiving waste. A one-week period was determined adequate because, generally, all wastes generated in each community throughout the state are collected and removed from the source at least once a week. The first surveillance was conducted August 4-11, 1975 at the Helena landfill. The final surveillance was conducted at the Great Falls landfill October 20-25, 1975. To insure that all surveillance data recorded was consistent, the same person conducted all ten surveillances.

During each surveillance the driver of each vehicle which entered the disposal site was interviewed. The time of arrival, type of vehicle, type of hauler and the vehicle's origin were recorded on pre-printed



LEGEND

▲ - SITE SURVEYED

■ - SITE SAMPLED

LANDFILL SITES INVESTIGATED

FIGURE III - 3

forms. Figure III-4 depicts the surveillance form used. For each vehicle the volume of waste was then estimated. The type of waste was also catagorized into one and/or two of the sixteen waste catagories as shown on the surveillance form. When two types of waste were recorded for a vehicle, the estimated percentage of each type waste was also recorded. It should be noted that for packer type vehicles, it was necessary to multiply the compacted volume of waste by a compaction factor to obtain the volume in "loose" cubic yards. The compaction factor used for each surveillance was based upon the degree of compaction the various packer type vehicles were attaining during the period each surveillance was conducted.

A CDC 6400 computer was used to process and sort the data and convert the solid waste volumes to weights. The volume's of waste were converted to weights by multiplying each material type's loose volume by an appropriate unit weight. The unit weights for each type material were determined by weighing known volumes of each type material. Table III-1 summarizes the densities of each type material which were utilized to determine the estimated material weights.

TABLE III-1
MATERIAL DENSITIES

Waste Type	Loose Density (lbs/cubic yd)
Residential	230
Commercial	220
Paper	180
Cardboard	180
Wood	230
Park and Yard	250
White Goods	300
Earth, Ash or Fill Material	1615
Construction-Demolition	500
Rubber	400
Plastics	95
Metallics	300
Glass	700
Textiles	140
Organic Wastes	1360
Furniture	100

MONTANA LANDFILL SURVEILLANCE QUESTIONNAIRE

DAY		TIME				TYPE VEH.		VEHICLE SIZE								TYPE HAULER		TYPE OF MATERIAL										ORIGIN OF WASTE		
								CY		(Ø)	DIMENSIONS							MAT'L		%			MAT'L		%					
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	OTHER

TYPE OF VEHICLE

1. Packer
2. F. L. Packer
3. O. T. Rolloff
4. Com. Rolloff
5. Transfer Trailer
6. Dump Truck.
7. Van
8. Flat Bed
9. Pick-up
10. Automobile
11. Vehicle w/Trailer

TYPE OF HAULER

1. Commercial Hauler
2. Private Citizen
3. Private Commercial
4. Private Industry
5. Contractor (Demo & Const.)
6. City Vehicle
7. County Vehicle
8. State Vehcile
9. Federal Vehicle

TYPE OF MATERIAL

1. Residential Waste
2. Commercial Waste
3. Paper
4. Cardboard
5. Wood
6. Park & Yard Wastes
7. White Goods
8. Earth, Ash, or Fill Material
9. Construction Demolition
10. Rubber
11. Plastics
12. Metallics
13. Glass
14. Textiles
15. Organic Wastes
16. Furniture

ORIGIN OF WASTES

1.
2.
3.
4.
5.
6.
7.
8.
9.
10.
11.
12.
13.
14.

FIGURE III-4

To tabulate and analyze the data obtained in each surveillance, four computer programs were utilized. Summarized below is the type data each computer program tabulated:

Program 1: As received quantities of refuse by type of vehicle and by type of waste.

Program 2: As received quantities of refuse by type of hauler and by type of waste.

Program 3: As received quantities of refuse by type of vehicle and by hours of the day.

Program 4: As received quantities of refuse by type of vehicle and by type of hauler.

Copies of Program 1 for each surveillance are included in Appendix B. Each printout illustrates the total estimated quantity of waste and the corresponding number of vehicles which entered each disposal site surveyed. Utilizing Program 1 it was also possible to determine the breakdown by material type. By utilizing the origin of waste data obtained in each survey it was also possible to obtain computer printouts which tabulated each citie's waste separately. Thus, separate waste generation data for various cities utilizing the same disposal site could be determined.

Utilizing the computer printouts which summarized each surveillance, quantities of wastes generated in several cities and rural areas throughout the state were obtained. The waste data which was obtained from each surveillance was then analyzed and adjusted to take into account the fact that construction-demolition, park and yard and wood type wastes are generated in large quantities only six months during the year. The "adjusted" quantities of waste for each

city or rural area were then divided by the respective estimated population to determine each jurisdiction's waste generation rate(lbs. of waste generated per person per day). Table III-2 summarizes the data obtained during each surveillance and the calculated waste generation rate for each major contributing jurisdiction.

An analysis of the table indicates that all data with the exception of the Flathead County surveillance data appears to be reliable. It is apparent that the waste origin data obtained during the Flathead County surveillance was inaccurate due to the large variances in waste generation rates calculated for the four jurisdictions contributing waste to the surveyed landfill. It should also be noted that due to the inability to define the population contributing waste to the landfill surveyed in Missoula, an accurate waste generation rate could not be determined. The fact that three disposal sites are available to Missoula area residents also compounded the problem.

Based on the surveillance results tabulated in Table III-2, it was the consultant's opinion that the waste generation data obtained from all surveillances, with the exception of the Flathead County and Missoula surveillances, was accurate and represented a cross-section of the generation of wastes throughout the state. The data obtained in the eight surveillances was then further analyzed to determine if any correlation or obvious trends in the various citie's and rural area's waste generation data was apparent.

Each calculated waste generation rate was subdivided where sufficient

TABLE III-2

SUMMARY OF SURVEILLANCE DATA

Surveillance	Jurisdiction	Adjusted Waste Received (Lbs/wkx100)	Estimated Population	Waste Gen. Rate (lb/person/day
Helena	Helena	9,270	24,500	5.40
Flathead County	Kalispell	10,336	10,892	13.56
	Whitefish	2,700	3,472	11.10
	Columbia Falls	42	2,556	2.34
	**Flathead County	917	24,937	0.52
Missoula	Missoula	16,660	N.A.	--
Butte	Butte(metro)	14,910	35,089	6.07
	Walkerville	225	1,097	2.93
	**Silverbow County	903	5,795	2.23
Bozeman	Bozeman(metro)	11,776	27,353	6.15
Victor	*Ravalli County	2,340	12,376	2.70
Billings	Billings(metro)	36,940	84,300	6.26
	Columbus	241	1,166	2.95
	**Stillwater County	482	3,706	1.86
Miles City	Miles City	3,963	9,500	5.96
Glasgow	Glasgow	2,616	6,500	5.75
Great Falls	Great Falls(metro)	20,850	66,043	4.51

* includes city of Hamilton

** includes rural population only

data was available into three general categories: Residential, Commercial-Industrial, and Demolition. Residential type waste included normal household wastes, municipal wastes and branch and yard wastes. Commercial-Industrial type wastes included ordinary wastes generated by commercial and industrial establishments. Demolition type wastes included construction and demolition rubble, organic wastes and inert, ash and fill material.

The breakdown of each jurisdiction's waste generation rate by waste type is shown in Table III-3. From the consultant's experience in other areas of the country where similar type studies have been conducted, it has been determined that areas with similar populations usually have similar waste generation rates. Thus, in the table the waste generation rates for each jurisdiction with similar populations were grouped together to determine if major correlations were apparent.

An analysis of the data shown in Table III-3 shows there are definite correlations between sizes of cities and waste generation rates. A brief summary of the waste generation data is provided below by population category:

a. Cities Greater than 10,000: Total waste generation rates of the cities with populations greater than 10,000 ranged from 4.68 lbs/person/day to 6.26 with an average of 5.75. The majority of the variance in generation rates for the cities was due to the large difference in demolition type material. The average percent breakdown by waste type was: 41% residential, 41% commercial and industrial and 18% demolition.

TABLE III-3
WASTE GENERATION RATE SUMMARY
(lbs./person/day)

Jurisdiction	WASTE TYPE Res.	Com.-Ind.	Demo.	Total	
Cities Greater Than 10,000					
Billings	2.59	2.30	1.37	6.26	
Bozeman	2.17	2.57	1.41	6.15	5.75
Butte	2.59 (2.33)	2.13 (2.33)	1.35 (1.09)	6.07	
Great Falls *	2.13	2.57	.93	5.63	
Helena *	2.21	2.06	.41	4.68	
Cities 5,000-10,000					
Miles City	2.30 (2.37)	2.56 (2.51)	1.10 (1.18)	5.96 (6.06)	
Glasgow	2.44	2.46	1.25	6.15	
Cities 1,000-5,000					
Columbus	2.30 (2.28)	.45 (.38)	.20 (.28)	2.95 (2.94)	
Walkerville	2.25	.30	.36	2.93	
Rural Areas					
Ravalli County **				2.70	
Silver Bow ***				2.23 (2.28)	
Stillwater County ***				1.86	

* Data is based on actual facility records for the past one year period

** Includes city of Hamilton

***Indicates rural population only

b. Cities 5,000-10,000. The table shows that the generation rates for the cities with populations between 5,000 and 10,000 compared quite closely with those of the larger cities. The percent breakdown by material type also compared quite closely with the larger cities.

c. Cities 1,000-5,000. For the cities with populations less than 1,000 there was a distinct reduction in the total waste generated compared to the larger cities. The major reason for this was the reduction in commercial and industrial wastes. The percent breakdown by material type for the average of the Columbus and Walkerville data illustrates this fact. The breakdown was: 79% residential, 13% commercial-industrial and 9% demolition.

d. Rural Areas. The average waste generation rate for the rural areas shown in Table III-3 was 2.28 lbs/person/day. This rate is substantially lower than all other population categories. This is expected since primarily only residential type wastes are generated in rural areas with very little commercial and industrial activity. Because of the small quantity of waste generated, a breakdown by waste type was not available.

4. Summary of Waste Generation Wastes. The waste generation data summarized in Table III-3 was thoroughly reviewed by the consultant, the State Solid Waste Bureau and the technical steering and review committee. It was the general consensus of the three parties that the

data obtained during the surveillances was representative of the waste generated throughout the state. Based on the surveillance data, average waste generation rates were developed for three general sizes of population centers in the state.

Table III-4 summarizes the average waste generation rates which were used to estimate quantities of waste generated in the State of Montana. The generation rates were developed utilizing the average generation data shown in Table III-3 and comparing the date with waste generation data obtained in other solid waste studies conducted by the consultant and governmental agencies.

TABLE III-4

RECOMMENDED WASTE GENERATION RATES
(lbs/person/day)

City Populations	WASTE TYPE Res.	Com-Ind.	Demo.	Total	Percent Processable
Greater than 5,000	2.30	2.30	1.10	5.70	75
1,000 to 5,000	2.20	.50	.55	3.25	83
Less than 1,000*	---	2.00 ---	.25	2.25	89

*includes rural population

It should be noted that not all waste generated is recyclable or recoverable. The majority of the materials which are not recoverable include: construction-demolition debris, large bulky items, organic waste and inert, ash and fill material. Regardless of the degree of resource recovery implemented, these type materials could not be accepted at a waste processing or resource recovery facility.

Included in Table III-4 is the estimated percentage of the total waste which could be processed at a solid waste reduction or resource recovery facility. For the population category; "Greater than 5,000" the estimated fraction of waste which is not processable was determined to be approximately 25 percent. This was determined from waste composition studies conducted at four disposal sites located throughout the state. An in-depth analysis is discussed in Part Four. The fraction of waste which is considered not processable for the remaining two population categories consists predominately of the wastes which have been classified "Demo." in table III-4.

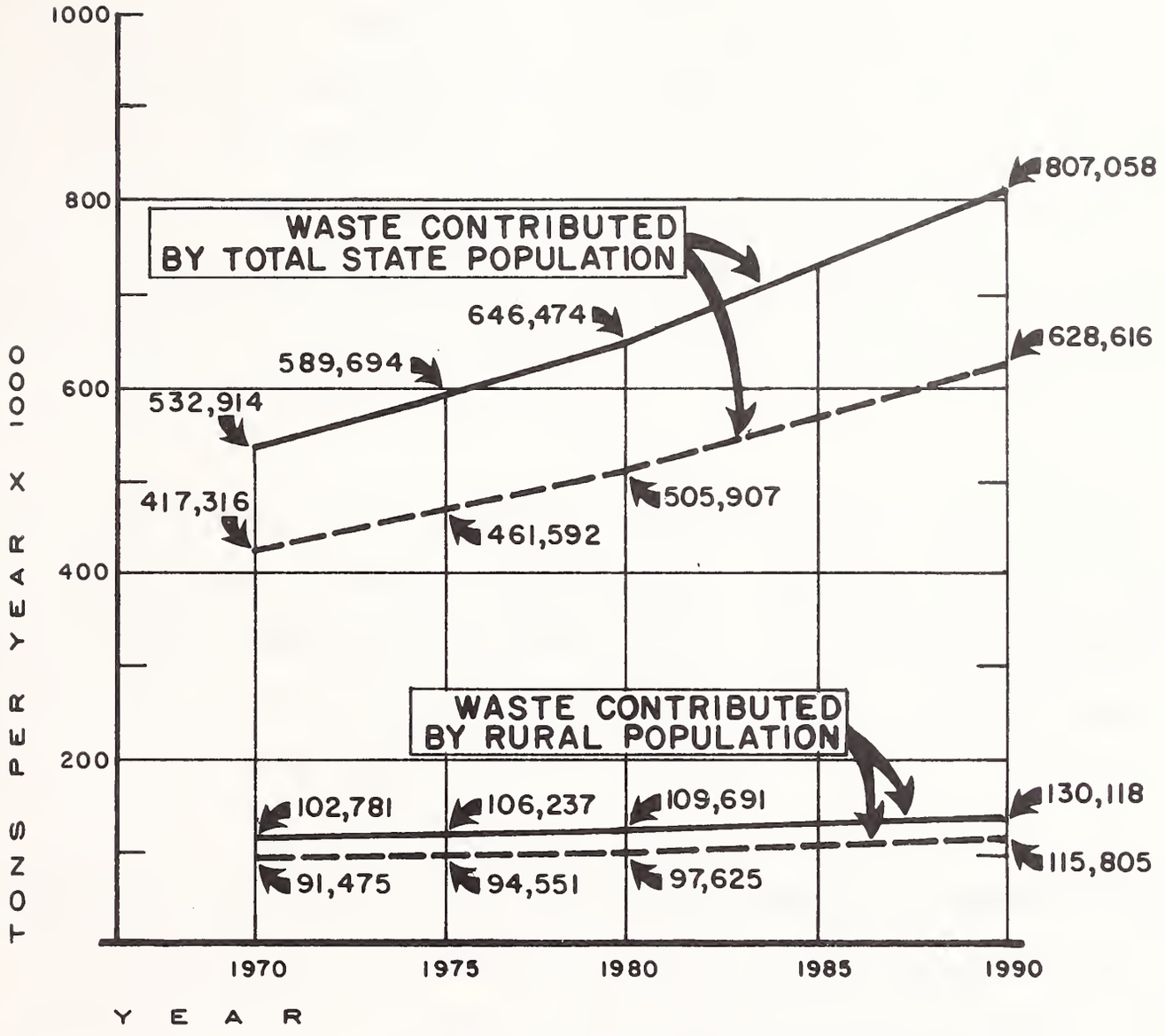
C. PROJECTED SOLID WASTE QUANTITIES

Several factors will affect the future generation of solid waste. These include: changes in packaging, changes in consumer demand, raw material shortages, energy requirements for manufacturing materials that are presently wasted and new legislation. At this time there is a strong effort underway by environmental forces to reduce solid waste generation at the source. Industry, is, however, resisting these changes, especially changes in packaging. The consumer, while becoming more aware of environmental problems, is still convenience oriented and the demand for disposable items has not diminished. The consultant does foresee a possible change in the composition of some wastes due to the energy shortage. After evaluating all of the conflicting forces, the consultant has concluded that it is not practical to predict what the change in generation might be. Thus, to project solid

waste quantities generated in the state, it was assumed the waste generation rates determined to be presently applicable in the state would remain constant through the year 1990.

Based on the average solid waste generation rates depicted in Table III-4, solid waste quantities have been projected through the year 1990. The quantities were determined by multiplying the present and projected populations of each city and rural area by the appropriate waste generation rate.

Figure III-5 graphically depicts the present and projected quantities of solid waste generated in the State of Montana. The figure illustrates in addition to the total waste generated, the quantity of waste which could be processed for resource recovery. As the figure shows approximately 590,000 tons if waste will be generated in the State of Montana in 1975. This represents an average waste generation rate of 4.28 lbs per person per day for all residents of the state. This average generation rate is approximately 15 percent below the nationally published generation rate of five lbs. per person per day primarily due to the sparse population and light industrial activity in the state. The figure also shows that the total waste generated in the state is projected to increase approximately 36 percent by 1990. The figure also indicated that approximately 462,000 tons or 78 percent of total waste generated in the state in 1975 could be received at a resource recovery processing facility. The remaining 22 percent is non-recoverable type materials such as demolition, organic and inert wastes.



NOTE: WASTE GENERATED BY RURAL RESIDENTS DOES NOT INCLUDE ORGANIC TYPE WASTES

KEY:

——— TOTAL WASTE GENERATED

— — — PROCESSABLE TYPE WASTES

PROJECTED SOLID WASTE QUANTITIES FOR STATE OF MONTANA

FIGURE III - 5

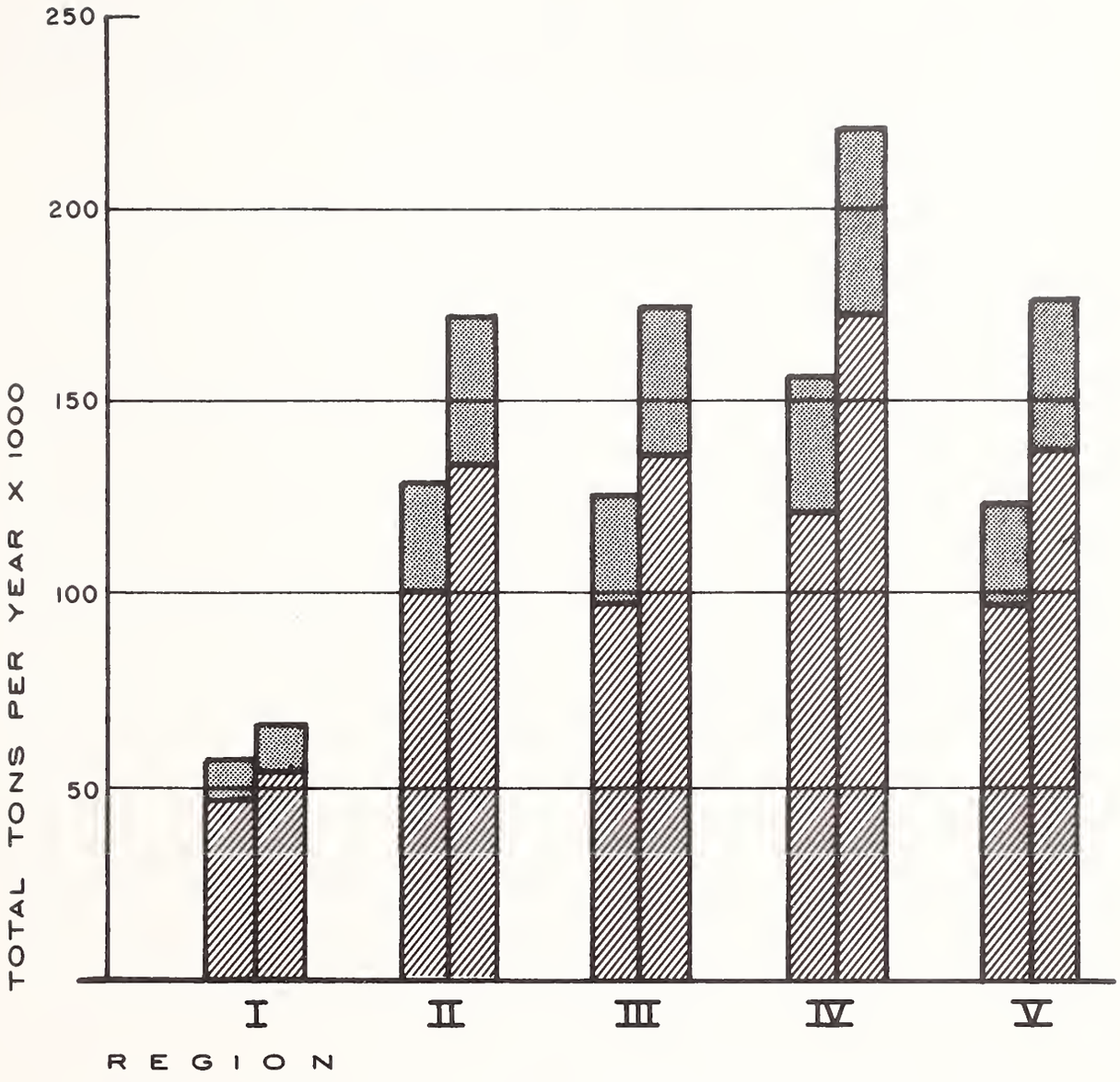
Figure III-5 also illustrates the quantity of waste which is generated by the state's rural population. As the figure shows the rural population generates approximately 18 percent of the total waste generated in the state. This percentage of waste is interesting to note when compared to the fact the rural population comprises approximately 40 percent of the state's population. In 1990 the percentage of waste generated by the rural population is expected to comprise only 16 percent of total waste generated in the state.

Listed in Table III-5 is a breakdown of the estimated waste quantities by planning district through the year 1990. The data listed in Table III-5 is further summarized in Figure III-6. As the figure dipicts, planning region IV contains the highest quantity of waste whereas region I contains the least.

It should be noted that all waste materials which are presently disposed of at places other than the public disposal sites, referred to as "on-site" disposal are not included in the quantities listed above. These wastes cannot, however, be over-looked. The on-site disposal wastes include those materials which, in the future, can be expected at public disposal facilities and those materials which will continue to be disposed of or accumulated on site. Observations within the state and talking to local officials has indicated this quantity to be quite small when compared to the total quantity of waste generated. The majority of the waste disposed on-site are from rural residents and large industries. To obtain specific waste disposal data for the larger industries who may be disposing of wastes on-site, questionnaires were sent to all

TABLE III-5
QUANTITIES OF SOLID WASTE
(Tons Per Year)

Planning District	1970 Total Waste Generated	1970 Total Waste Processable	1980 Total Waste Generated	1980 Total Waste Processable	1990 Total Waste Generated	1990 Total Waste Processable
1	19,711	16,486	23,625	19,446	31,153	25,119
2	19,086	15,237	19,150	15,357	19,347	15,528
3	17,684	14,254	16,288	13,203	16,386	13,363
Region I Total	56,481	45,977	59,063	48,006	66,886	54,010
4	18,883	14,974	21,366	16,881	24,588	19,346
5	98,718	76,250	119,810	93,165	146,406	112,535
Region II Total	117,601	91,224	141,176	110,046	170,994	131,881
6	14,194	11,572	16,003	12,969	18,191	14,749
7	96,967	74,664	122,752	94,338	156,300	120,246
Region III Total	111,161	86,236	138,755	107,307	174,491	134,995
8	35,281	27,074	48,099	37,100	67,664	51,985
9	37,878	29,319	55,145	42,394	75,919	58,350
12	65,038	50,570	68,092	53,484	76,173	59,119
Region IV Total	138,197	106,963	171,335	132,978	219,756	169,454
10	44,169	36,020	50,863	41,231	63,716	51,245
11	65,305	50,896	85,281	66,341	111,215	87,031
Region V Total	109,474	86,916	136,144	107,572	174,931	132,276
Study Area Total	532,914	417,316	646,474	505,909	807,058	628,616



TYPE WASTE

- NON-PROCESSABLE
- PROCESSABLE

KEY:

SOLID WASTE GENERATION BY PLANNING REGION

FIGURE III - 6

industries in the state with ten or more employees. The data from the returned questionnaires is presently being analyzed. The results and conclusions of the industrial waste questionnaire will be included in the market report to be completed in February, 1976.

PART IV

SOLID WASTE COMPOSITION

A. PHYSICAL CHARACTERISTICS

Solid waste is not a uniform homogenius material wherein the percentage of its components can be readily defined. Various solid waste textbooks have predicted general percentage characteristics. The Environmental Protection Agency (E.P.A.) and the National Center for Resource Recovery (N.C.R.R.) have also conducted studies and have predicted solid waste composition characteristics. In addition, the consultant has sampled municipal solid waste in five cities in the United States in conjunction with other solid waste studies. Table IV-1 summarizes the sampling data obtained by the consultant in other cities in the country and also data published by the E. P. A. AND N. C. R. R.

To compare the composition of the waste generated in other parts of the country with the wastes generated in Montana, a solid waste sampling program was conducted in four Montana cities. These cities included: Missoula, Butte, Billings and Great Falls. The sampling program in each city was conducted in conjunction with each citie's disposal site surveillance. The main objective of the sampling program was to determine the percent composition by weight of the waste hauled to the landfill in packer type vehicles. This waste consisted predominately of residential and commercial type wastes.

The procedure for obtaining and separating the samples was as follows: Packer truck drivers were interviewed to determine the origin and type of wastes they had collected. The driver was then directed to dump

TABLE IV-1

SOLID WASTE COMPOSITION DATA

Type Waste	HDR Samplings								EPA Data	NCRR Data
	Dubuque (Res)	Dubuque (Comm)	Dallas (Res)	Dallas (Comm)	Norfolk (All Waste)	St. Cloud (Res)	St. Cloud (Comm)	Rochester (Res-Comm)	(Res-Comm)	(Res-Comm)
Paper	40.5	53.2	40.08	55.56	44.0	51.0	58.7	46.2	37.8	42.7
Plastic	5.3	7.7	2.84	3.58	4.3	4.1	3.7	5.6	3.8	1.7
Wood	0.6	1.0	3.12	6.77	2.0	2.3	1.6	2.0	3.7	2.5
Textile	2.4	1.7				3.6	4.4	3.2	1.6	2.4
Rubber	0.2	0.0	39.57	16.78	21.9	1.0	3.3	0.0	2.7	*1.8
Yard	25.0	7.2				0.6	0.0	9.1	14.6	12.5
Food	10.6	7.5				20.1	13.4	14.6	14.2	14.6
Total Combustibles	84.6	78.3	85.6	82.69	75.7	82.7	85.1	80.7	78.4	78.2
Glass	5.4	6.7	5.65	8.59	14.2	8.8	5.8	9.0	10.0	10.3
Ferrous	8.8	13.6	7.97	7.82	9.4	8.0	8.8	9.5		8.2
Aluminum	1.1	1.1	0.77	0.90	0.67	0.5	0.3	0.8	10.1	0.9
Other Metal	0.1	0.3	----	----	----	----	----	----		0.4
Organics	----	----	----	----	----	----	----	----	1.5	2.0
Total Non-Combustibles	15.4	21.7	14.4	17.31	24.3	17.3	14.6	19.3	21.6	21.8
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

his entire load of refuse adjacent to the normal filling operation. By use of a front loader, the deposited refuse was then mixed thoroughly. After the refuse was mixed, the front-end loader operator obtained approximately a one-two cubic yard sample from the center of the refuse. The sample was then hand separated by both the State Solid Waste Bureau and the consultant's personnel into the following materials:

Non-Combustibles	Combustibles
Ferrous	Paper
Aluminum	Cardboard
Glass	Plastic
Other	Wood
	Yard Wastes
	Textiles
	Food
	Other

Each of the above types of material was then weighed on scales to the nearest ounce and recorded to determine each material's percent composition by weight. The results of each citie's sampling program are tabulated in Appendix C. The averaged results of each citie's sampling program are summarized in Table IV-2. The sampling data obtained from the four cities was then averaged and seasonally adjusted to take into account the fact that park and yard wastes are generated predominately between the months of April and October. The seasonally adjusted data is also summarized in Table IV-2.

The seasonally adjusted composition obtained from the four Montana cities was then compared to the data published by the EPA and NCRR. Table IV-3 summarizes this comparison. As the data in this table indicates, the waste composition in Montana compared quite closely

Table IV-2

MONTANA SAMPLING PROGRAM SUMMARY
(Percent by Wt.)

Sample Location	Paper	Card Board	Plastic	Cloth	Wood	Yard	Food	Sub Total	Ferrous	Aluminum	Glass	Sub Total	Total
Missoula	25.0	10.3	4.3	3.2	2.2	29.6	12.9	87.5	6.2	1.4	4.9	12.5	100.00
Butte	24.3	7.0	6.1	3.9	0.1	14.3	21.9	77.6	9.0	2.5	10.9	22.4	100.00
Billings	24.9	10.1	6.1	6.0	1.0	12.2	20.5	80.8	9.0	1.8	8.4	19.2	100.00
Great Fls.	26.9	8.2	4.2	2.7	1.5	28.0	13.6	85.1	6.7	1.7	6.5	14.9	100.00
Total	101.4	35.6	20.7	15.8	4.8	84.1	68.9	331.0	30.9	7.4	30.7	69.0	400.00
Avg.	25.3	8.9	5.2	4.0	1.2	21.0	17.2	82.8	7.7	1.8	7.7	17.2	100.00

SEASONALLY ADJUSTED

Avg.	28.3	9.9	5.8	4.4	1.3	11.7	19.3	80.7	8.6	2.0	8.7	19.3	100.0

TABLE IV-3

WASTE COMPOSITION COMPARISON
(Percent by Weight)

WASTE TYPE	MONTANA ADJUSTED	E. P. A.	N.C.R.R.
Paper	38.2	37.8	42.7
Plastic	5.8	3.8	1.7
Yard	11.7	14.6	12.5
Food	19.3	14.2	14.6
Glass	8.7	10.0	10.3
Metals	10.6	10.1	9.5
Other	5.7	9.5	8.7
Total	100.0	100.0	100.0

to the nationally published data. The largest descrepencies occurred in the percentages of plastic and food type wastes. Because scrap ferrous and aluminum are in demand, the quantity of these type materials generated in the solid waste stream is an important factor. As the table shows, the percentage of metals disposed of in the four Montana cities sampled compared quite closely to nationally published data.

The composition data depicted in Tables IV-1 through IV-3 represents only a composite of the wastes hauled to the respective disposal sites by packer trucks. To obtain a complete breakdown of all wastes hauled to the Billings, Butte and Great Falls disposal sites, the average solid waste sampling data obtained in each city was incorporated into each citie's disposal site surveillance data. This was accomplished by substituting each citie's solid waste composition data for all wastes which were hauled to the disposal site by packer type vehicles. It should be noted that all other wastes hauled to the disposal site during each surveillance was specifically categorized by waste type. A computer program was developed which utilized the sampling and surveillance data to give a complete physical breakdown of all the wastes hauled to the Billings, Butte and Great Falls disposal sites. It should be noted that a complete breakdown of the wastes disposed of in the Missoula area by material type could not be obtained. This was due to the fact that the Missoula area residents have three disposal sites available for their use and a detailed breakdown of wastes by material type was available at only one.

Table IV-4 summarizes the waste breakdown data for the cities of Billings, Butte and Great Falls. As the table illustrates there

TABLE IV-4

SUMMARY OF TOTAL WASTE COMPOSITION
(Percent by Weight)

Characteristic	Billings	Butte	Great Falls *	Average
Combustibles	45.3	63.0	66.3	58.2
Paper	13.6	27.0	15.7	18.8
Cardboard	7.2	8.1	7.9	7.7
Other	24.5	27.9	42.7	31.7
Non-Combustibles	54.7	37.0	33.7	41.8
Ferrous	5.6	6.9	5.3	5.9
Non-ferrous	1.0	1.0	1.0	1.0
Glass	4.6	4.5	3.8	4.3
Other	43.5	24.6	23.6	30.6
Total	100.0	100.0	100.0	100.0
Non-Processable	34.7	17.1	23.8	25.2

* includes wastes received at Great Falls reduction plant and Great Falls city landfill

was a wide variance in each citie's waste breakdown. The table also depicts the average of the waste breakdown data for the three cities. The average of the data indicated that approximately 58 percent of the total waste delivered to the three citie's disposal sites was combustible and could be utilized as an energy fuel source. The averaged data depicted in the table also indicates that approximately 6.9 percent (5.9+1.0) of the total waste disposed of was recoverable metals.

Table IV-4 also indicated the percentage of waste which could not be accepted at a resource recovery processing facility. These type wastes would include: earth, ash and fill material; bulky materials; construction-demolition debris; and organic type wastes. As the table indicates, the percentage of non-processable type wastes varied from 17.1 percent in Butte to 34.7 percent in Billings. The average percentage of non-processable type wastes for the three cities analyzed was approximately 25 percent of the total waste disposed of. It should be noted that regardless of the degree of resource recovery implemented, a disposal method would be required for this type material. It is interesting to note that the average percentage of non-processable type material delivered to the three citie's disposal sites compared to within 0.2 percent of the nationally published average of 25 percent.

Listed in Table IV-5 is the estimated average breakdown of the wastes shown in Table IV-4 if the non-processable type wastes are excluded. The table indicates that approximately 77 percent of all processable type wastes could be utilized as an energy source and 9.2 percent would be recoverable type metals.

TABLE IV-5

COMPOSITION OF PROCESSABLE WASTES

Type Material	Percent of Processable Wastes
Combustibles	77.0
Paper	25.0
Cardboard	10.0
Other	42.0
Non-Processable	23.0
Ferrous	7.9
Non-ferrous	1.3
Glass	5.7
Other	8.1
Total	100.0

The data depicted in Table IV-5 was compared to nationally published data and data obtained in other parts of the country by the consultant. The comparison revealed that the averaged composition data for the cities of Billings, Butte and Great Falls compared quite closely to the previously published data. Thus, it was the consultant's opinion that the waste composition data summarized in Table IV-5 is representative of the composition of all processable type wastes generated in the State of Montana.

Based on the composition data summarized in Table IV-5 and the waste quantities which were developed in Part III of this report, the estimated quantity of processable wastes by material type was determined for the State of Montana. Table IV-6 summarizes these quantities. Approximately 355,000 tons of waste generated in the state is combustible and

is available as an energy source. This quantity is expected to increase approximately 27 percent by 1990. The table also indicates that approximately 36,000 tons of ferrous and 6,000 tons of non-ferrous metals could be recovered in 1975.

TABLE IV-6

QUANTITIES OF PROCESSABLE WASTES
(Tons per Year)

Waste Type	1975	1990
Combustibles	355,426	484,034
Paper	115,398	157,154
Cardboard	46,159	62,862
Other	193,869	264,018
Non-combustibles	106,160	144,582
Ferrous	36,465	49,661
Non-ferrous	6,001	8,172
Glass	26,311	35,831
Other	37,389	50,918
Total	461,592	628,616

B. CHEMICAL CHARACTERISTICS

Because of the present energy crisis, which is due to the shortage and/or the high cost of conventional fossil fuels such as petroleum and natural gas, alternative fuel sources are being reevaluated or developed. Solid waste is receiving increasing consideration in this regard because it is available and it can be processed for use as a fuel. Throughout North America and Europe, it is being demonstrated that solid waste can be processed and used as a source of energy along with other fossil fuels.

To determine the present worth of solid waste as an energy source and to also obtain other valuable combustible characteristics of solid waste generated within the state, fifty (50) random samples of solid waste were obtained and analyzed using laboratory techniques. The samples ranged from 4-15 lbs and were obtained from the open fill face at four landfills located across the state. Eight samples were obtained from Missoula, ten samples from Butte, sixteen samples from Billings and sixteen from Great Falls.

Basically, the laboratory analysis consisted of determining the percent moisture, carbon, hydrogen, nitorgen, chlorine, sulfur, ash, oxygen and heat value (BTU/lb.). The results of the laboratory analysis are included in Appendix D of this report. Tabulated in Table IV-7 is a summary of the moisture, ash and sulfur contents and the heating values for the samples obtained in each city. The heating value in combination with the moisture and ash content establishes the suitability of solid waste as an energy source. The sulfur content establishes the quantity of sulfur oxide emissions.

As Table IV-7 indicates, there was a wide variance in the laboratory results. The "as-received" heating value of the fifty samples varied from 1983 BTU/lb. to 7023 BTU/lb which represented a 350 percent variance. The percent ash showed the largest variance of the chemical characteristics analyzed, with a variance of 1.54 to 30.97 percent. The table also shows that the moisture content of the samples obtained in Billings was the highest of the four cities analyzed. This was due to the

TABLE IV-7

SUMMARY OF LABORATORY ANALYSIS

	Moisture%	Sulfur%	Ash%	BTU/lb As received	BTU/lb Dry
Billings:					
Average	41.3	.31	11.29	4519	7739
Maximum	71.3	.96	16.49	8270	8860
Minimum	18.9	.08	1.54	1983	6327
Butte					
Average	26.6	.11	8.73	6049	7402
Maximum	42.0	.18	10.45	7023	9241
Minimum	12.0	.08	4.29	4425	7511
Great Falls					
Average	34.9	.23	11.87	4748	7278
Maximum	52.2	.58	30.97	6643	8495
Minimum	21.8	.12	1.06	3732	5884
Missoula					
Average	37.8	.12	13.27	4843	7746
Maximum	59.1	.17	16.71	5987	9552
Minimum	19.9	.05	7.86	2946	6475

extreme heavy moisture obtained during the week the samples in Billings were obtained.

The laboratory data obtained from the four Montana cities was averaged and compared to other available solid waste chemical analysis data. For the major chemical characteristics the average percent by weight of the fifty samples obtained in Montana are listed in Table IV-8. Solid waste testing data conducted by the EPA is also listed in the table for comparison purposes. As Table IV-8 depicts, the average heat value of the waste samples received in Montana was 5039 BTU/lb on an as-received basis. This compared quite closely with the data published by the EPA. The data also compares reasonably close to data obtained by the consultant in other areas of the country where solid waste has been chemically analyzed. The moisture content of the waste samples obtained in Montana was slightly higher than the nationally published data. This was predominately due to the heavy moisture which occurred in Billings and Missoula at the time the samples were obtained.

Based on the results of the solid waste testing program for the waste samples obtained in Billings, Missoula, Butte and Great Falls, a heat value of 5,000 BTU/lb for processable type wastes will be used in this study for the purpose of determining the present worth of solid waste as a fuel source. The heat value will be based on an "as received" moisture content of 35 percent. This heat value is somewhat conservative when compared to the actual laboratory testing data obtained. In comparison this represents approximately one-half the heat value of Montana coal.

TABLE IV-8

COMPARISON OF CHEMICAL CHARACTERISTICS
(Average Percent by Weight)

Characteristic	Montana	E.P.A.
Moisture	35.2	29.5
Sulfur	0.19	0.11
Ash	11.3	20.3
Heat Value (BTU/lb.)		
As-received	5039	4675
Dry	7541	N.A.

An analysis of the percent sulfur obtained from the samples indicates a wide range varying from .05 percent in Missoula to .96 percent in Billings. A comparison between the average sulfur content of the samples obtained in Montana and average data published by the EPA also shows a considerable difference. It is the consultant's opinion that if additional samples were obtained in Montana and analyzed, the average sulfur content would approach that determined by the EPA. This is based on the fact that the EPA data is based on 211 samples where as the Montana data is based on 50. It is interesting to note that on an equivalent heating value basis the sulfur oxide emissions resulting from the combustion of coal would be approximately three times greater than the combustion of solid waste.

APPENDIX A

POPULATION PROJECTIONS

BY COUNTY

Montana County and State Population Projections by Sex and Age Using the CEMS Model

I. METHODOLOGY

The CEMS (Census Estimate-Migration Survival) Model uses current census migration estimates to develop a migration rate which is used with migration-survival methodology to project population by age and sex. In the migration-survival method of projecting population by sex and five-year age intervals the components of mortality and fertility for each cohort are treated as a single component in the form of a survival rate. These survival rates, called national census survial rates, are determined using United States census figures for 1960 and 1970 which are adjusted to include United States Armed Services overseas and to exclude net migration to the United States for 1960 to 1970. The use of national census survival rates at the local level (state and county) assumes there are no significant differences from area to area for a given sex-race cohort in mortality levels. Other assumptions include no significant difference in the completeness of coverage in the 1970 census relative to the 1960 census and that the degree of consistency of reporting race between the 1960 census and 1970 census was not significantly different. The assumption of no significant difference from area to area in mortality levels is essentially valid; however, current information on the assumptions relating to coverage and consistency in reporting race from census to census seems to indicate wide discrepancies, especially with relationship to American Indians.

DIVISION OF RESEARCH AND INFORMATION SYSTEMS
DEPARTMENT OF INTERGOVERNMENTAL RELATIONS
MONTANA POPULATION PROJECTIONS

COUNTY SUMMARIES
USING
THE CEMS MODEL

COUNTIES	1960 CENSUS	1970 CENSUS	NET 1960-70 MIGRATION	PROJECTIONS 1975	1980	1985	1990
BEAVERHEAD COUNTY	7194	8187	322	7710	6898	6187	5763
BIG HORN COUNTY	12007	10057	-1958	11824	14320	17474	20744
BLAINE COUNTY	9091	6727	-2269	6903	7285	7808	8124
BROADWATER COUNTY	2804	2526	-442	2883	3363	4023	4646
CARBON COUNTY	8317	7090	-1257	7727	9309	10252	11682
CARTER COUNTY	2493	1956	-690	1833	1667	1580	1407
CASCADE COUNTY	73418	81804	-2885	89207	97439	106978	116842
CHOUTEAU COUNTY	7268	6473	-1300	5720	4884	4213	3713
CUSTER COUNTY	13227	12174	-2156	11135	9874	8825	8044
DANIELS COUNTY	3755	3083	-820	3215	3403	3689	3917
DAWSON COUNTY	12314	11269	-2534	10958	10656	10465	10201
DEER LODGE COUNTY	18640	15652	-3719	15827	16402	17065	17205
FALLON COUNTY	3997	4050	-504	3814	3450	3186	2979
FERGUS COUNTY	14018	12611	-2490	13078	13869	14873	15674
FLATHEAD COUNTY	32965	39460	3405	41171	42471	44220	46831
GALLATIN COUNTY	26045	32505	3368	38219	47564	57233	67636
GARFIELD COUNTY	1981	1796	-334	1876	1905	2009	2008
GLACIER COUNTY	11565	10783	-3162	12068	13953	16255	18510
GOLDEN VALLEY COUNTY	1203	931	-260	872	991	1082	1068
GRANITE COUNTY	3014	2737	-460	2570	2311	2140	1937
HILL COUNTY	18653	17358	-3700	17892	18930	20017	20770
JEFFERSON COUNTY	4297	5238	704	6219	7459	9087	10959
JUDITH BASIN COUNTY	3085	2667	-541	2652	2608	2656	2629
LAKE COUNTY	13104	14445	335	17376	21750	27780	35345
LEWIS & CLARK COUNTY	28006	33281	1614	38224	44572	52432	61633
LIBERTY COUNTY	2424	2359	-572	2634	2976	3438	3782
LINCOLN COUNTY	12537	18063	3279	17569	16084	14582	14175
MCCONE COUNTY	3321	2875	-559	2878	2865	2939	2913
MADISON COUNTY	5211	5014	-236	5727	6769	8188	9742
MEAGHER COUNTY	2616	2122	-721	2302	2535	2874	3067
MINERAL COUNTY	3027	2958	-467	3508	4242	5219	6222
MISSOULA COUNTY	44653	58263	7005	64304	70467	77448	85653
MUSSELSHELL COUNTY	4388	3734	-1223	4137	4837	5773	6611
PARK COUNTY	13168	11107	-2483	12113	13511	15392	16885
PETROLEUM COUNTY	994	675	-245	680	637	655	585
PHILLIPS COUNTY	5027	5386	-1119	5181	4945	4805	4623
POWDER RIVER COUNTY	7653	6611	-1774	7712	9414	11596	13843
POWELL COUNTY	2485	2962	165	2453	2273	2010	1854
PRAIRIE COUNTY	7032	6660	-958	7050	7557	8181	8554
RAVALLI COUNTY	2313	1752	-641	1983	2325	2816	3213
RICHLAND COUNTY	12341	14409	1604	17556	22397	29361	38567
ROOSEVELT COUNTY	10504	9837	-1792	9816	9819	9917	9877
ROSEBUD COUNTY	11731	10365	-3138	10272	9326	9695	9431

ASSUMPTIONS: CONTINUED 1960-1970 FERTILITY AND MORTALITY RATES AND 1970-72 MIGRATION TRENDS WITH CONSTRAINTS

DIVISION OF RESEARCH AND INFORMATION SYSTEMS
DEPARTMENT OF INTERGOVERNMENTAL RELATIONS
MONTANA POPULATION PROJECTIONS

COUNTY SUMMARIES
USING
THE CEMS MODEL

COUNTIES	1960 CENSUS	1970 CENSUS	NET 1960-70 MIGRATION	PROJECTIONS 1975	1980	1985	1990
ROSEBUD COUNTY	6187	6032	-960	6996	8385	10174	12117
SANDERS COUNTY	6880	7093	-164	8145	9532	11622	13902
SHERIDAN COUNTY	6458	5779	-1075	5607	5416	5315	5141
SILVER BOW COUNTY	46454	41981	-9490	42293	45659	48376	50409
STILLWATER COUNTY	5526	4632	-983	4979	5505	6191	6715
SWEET GRASS COUNTY	3290	2980	-343	3039	3082	3196	3291
TETON COUNTY	7295	6116	-1403	6925	8178	9727	11153
TOOLE COUNTY	7904	5839	-2497	5389	5040	4791	4367
TREASURE COUNTY	1345	1069	-336	1101	1116	1190	1177
VALLEY COUNTY	17080	11471	-9424	13163	15482	20649	24569
WHEATLAND COUNTY	3026	2529	-569	2447	2329	2299	2169
WIBAUX COUNTY	1698	1465	-357	1355	1178	1081	952
YELLOWSTONE COUNTY	79016	87367	-542	96728	108517	122197	136935

ASSUMPTIONS: CONTINUED 1950-1970 FERTILITY AND MORTALITY RATES AND 1970-75 MIGRATION TRENDS WITH CONSTRAINTS

DIVISION OF RESEARCH AND INFORMATION SYSTEMS
DEPARTMENT OF INTERGOVERNMENTAL RELATIONS
MONTANA POPULATION PROJECTIONS

USING
THE CEMS MODEL

STATE OF MONTANA

SEX	AGE YEARS	1960 CENSUS	1970 CENSUS	NET 1960-70 MIGRATION	PROJECTIONS 1975	1980	1985	1990
MALE								
	0- 4	42184	29120	-993	31293	36197	41534	44994
	5- 9	39037	26959	-3210	40623	45942	51808	57108
	10-14	33990	30729	-2659	34866	30190	29735	37527
	15-19	25429	35512	-3735	37252	38929	42110	40301
	20-24	19636	25529	-7741	35554	43535	44402	37083
	25-29	19428	21171	-3457	29881	36812	41721	40354
	30-34	21741	18626	-737	20844	25654	33230	43747
	35-39	21704	17958	-1056	18405	21296	27288	37029
	40-44	21956	19406	-1175	18389	18564	20703	25568
	45-49	20670	19535	-1016	18172	17353	17887	20579
	50-54	17735	19638	-742	19159	18342	17651	17546
	55-59	15079	17443	-746	17765	17543	15809	15583
	60-64	12090	14585	-365	15992	16757	16795	15651
	65-69	11575	10820	-503	11909	13098	13739	13174
	70-74	10644	7728	-376	8512	9842	11012	11309
	75-79	6021	6164	51	5826	5716	6021	6920
	80 AND OVER	4605	7081	234	7788	8329	8848	9486
	TOTALS	343743	347005	-28324	371152	404099	441293	479048
FEMALE								
	0- 4	40918	27934	-1138	30108	35011	40365	43881
	5- 9	38011	35299	-2739	38901	44242	50151	55451
	10-14	33143	38890	-2040	33673	28640	27986	35895
	15-19	25338	34934	-3482	36023	37202	40147	45627
	20-24	19942	25993	-7084	35573	42977	43306	31650
	25-29	19454	21031	-4140	29183	37455	42250	40091
	30-34	20488	19051	-950	21699	26707	34166	44158
	35-39	20979	19305	-1056	18496	21519	27742	38334
	40-44	21744	19329	-892	18472	19218	21725	26941
	45-49	19269	19127	-1069	18402	18089	18832	21266
	50-54	15600	19537	-952	19401	18937	18508	18828
	55-59	13413	17283	-733	18045	18198	17877	17211
	60-64	11443	13850	-430	16442	18659	19534	18086
	65-69	11222	11209	-758	13262	15418	16726	16235
	70-74	9555	9070	-462	10021	11531	13429	15535
	75-79	6122	7714	118	7572	7586	8346	10436
	80 AND OVER	4975	8040	422	9315	10572	11232	12137
	TOTALS	331024	347404	-27639	375479	411961	452331	492722
TOTALS		674767	694409	-55934	746831	816060	893624	970770

ASSUMPTIONS: CONTINUED 1960-1970 FERTILITY AND MORTALITY RATES AND 1970-73 MIGRATION TRENDS WITH CONSTRAINTS

APPENDIX B

LANDFILL SURVEILLANCE

COMPUTER PRINTOUTS

LANDFILL SURVEY ANALYSIS PACKAGE

AS RECEIVED QUANTITIES OF REFUSE BY TYPE OF VEHICLE AND BY TYPE OF WASTE

BILLINGS SANITARY LANDFILL SURVEY
SUMMARY REPORT

TYPE OF VEHICLE	RESIDENTIAL			COMMERCIAL			PAPER			CARDBOARD			WOOD		
	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH
PACKER	7160	16468	125	5283	11622	98	0	0	0	0	0	0	0	0	0
F.L. PACKER	54	124	1	18	40	0	0	0	0	0	0	0	0	0	0
O.T. ROLLOFF	0	0	0	0	0	0	0	0	0	0	0	0	5	11	1
COMP. ROLLOFF	0	0	0	32	70	5	0	0	0	26	47	5	6	14	1
TRANSFER TRAILER	105	241	2	35	77	0	0	0	0	0	0	0	0	0	0
DUMP TRUCK	37	85	6	29	64	3	10	18	2	222	400	27	224	515	21
VAN	6	14	6	0	0	0	7	12	3	121	218	25	36	83	8
FLATBED	5	11	1	9	20	3	0	0	0	17	31	3	17	39	3
PICKUP	329	756	235	63	139	39	9	16	5	115	208	60	173	399	89
AUTOMOBILE	20	45	20	0	0	0	1	2	1	2	4	2	2	5	2
VEHICLE WITH TRAILER	14	33	7	13	29	2	5	9	1	12	22	3	19	44	4
TANKER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	7729	17778	403	5482	12060	150	31	57	12	516	929	125	482	1110	129

TYPE OF VEHICLE	PARK + YARD			WHITE GOODS			EARTH-ASH-FILL			CONSTRUCTION DEMO			RUBBER		
	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH
PACKER	0	0	0	0	0	0	0	0	0	0	0	0	171	684	3
F.L. PACKER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
O.T. ROLLOFF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
COMP. ROLLOFF	6	15	1	0	0	0	208	3359	18	0	0	0	0	0	0
TRANSFER TRAILER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DUMP TRUCK	364	910	41	2	6	0	365	5896	39	452	2261	48	8	30	0
VAN	17	41	5	5	15	1	0	7	0	9	46	3	1	4	0
FLATBED	69	173	9	0	0	0	0	0	0	15	75	3	0	0	0
PICKUP	637	1594	312	35	106	15	46	744	27	172	859	84	39	159	6
AUTOMOBILE	8	21	8	0	0	0	1	16	1	0	0	0	0	0	0
VEHICLE WITH TRAILER	79	197	22	4	12	0	2	37	1	26	132	9	5	20	1
TANKER	0	0	0	0	0	0	10	161	1	0	0	0	0	0	0
TOTAL	1181	2952	398	46	139	16	633	10221	87	675	3374	147	224	897	10

TYPE OF VEHICLE	PLASTICS			METALLICS			GLASS			TEXTILES			ORGANIC		
	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH
PACKER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
F.L. PACKER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
O.T. ROLLOFF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
COMP. ROLLOFF	0	0	0	0	0	0	0	0	0	0	0	0	120	1632	6
TRANSFER TRAILER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DUMP TRUCK	34	33	4	42	127	5	0	0	0	3	4	1	40	544	4
VAN	0	0	0	0	0	0	0	0	0	1	1	1	18	245	7
FLATBED	0	0	0	0	1	0	0	0	0	0	0	0	2	27	1
PICKUP	0	0	0	65	195	27	0	0	0	24	34	8	4	48	2
AUTOMOBILE	0	0	0	1	3	1	0	0	0	2	3	2	1	14	1
VEHICLE WITH TRAILER	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TANKER	0	0	0	0	0	0	0	0	0	0	0	0	50	680	6
TOTAL	35	33	4	109	326	33	0	0	0	30	42	12	234	3189	27

TYPE OF VEHICLE	FURNITURE			TOTAL		
	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH
PACKER	0	0	0	12614	28774	226
F.L. PACKER	0	0	0	72	164	1
O.T. ROLLOFF	0	0	0	5	11	1
COMP. ROLLOFF	0	0	0	398	5137	36
TRANSFER TRAILER	0	0	0	140	318	2
DUMP TRUCK	13	13	1	1846	10907	202
VAN	0	0	0	221	687	59
FLATBED	9	9	2	144	387	25
PICKUP	53	53	22	1765	5307	931
AUTOMOBILE	0	0	0	38	112	38
VEHICLE WITH TRAILER	7	7	2	188	542	52
TANKER	0	0	0	60	841	7
TOTAL	83	83	27	17491	53189	1580

NOTE: MULTIPLY ALL POUNDS SHOWN BY A FACTOR OF 100

LANDFILL SURVEY ANALYSIS PACKAGE

AS RECEIVED QUANTITIES OF REFUSE BY TYPE OF VEHICLE AND BY TYPE OF WASTE

BOZEMAN SANITARY LANDFILL
SUMMARY REPORT

TYPE OF VEHICLE	RESIDENTIAL			COMMERCIAL			PAPER			CARDBOARD			WOOD		
	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH
PACKER	1339	3080	33	1630	3586	37	32	58	1	75	135	2	0	0	0
F.L. PACKER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
O.T. ROLLOFF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
COMP. ROLLOFF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TRANSFER TRAILER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DUMP TRUCK	6	14	2	24	53	3	5	8	1	71	128	11	54	125	8
VAN	1	2	1	1	2	1	10	19	3	30	55	9	4	9	2
FLATBED	3	6	2	10	21	2	0	0	0	6	11	1	18	41	5
PICKUP	95	218	70	51	111	28	6	11	4	90	163	41	74	169	36
AUTOMOBILE	7	16	7	0	0	0	1	1	1	4	7	3	0	0	0
VEHICLE WITH TRAILER	6	14	4	16	36	4	4	6	1	42	76	6	29	67	10
TANKER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	1457	3351	119	1732	3810	75	57	103	11	319	573	73	179	411	61

TYPE OF VEHICLE	PARK + YARD			WHITE GOODS			EARTH-ASH-FILL			CONSTRUCTION DEMO			RUBBER		
	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH
PACKER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
F.L. PACKER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
O.T. ROLLOFF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
COMP. ROLLOFF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TRANSFER TRAILER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DUMP TRUCK	206	515	25	3	9	1	60	973	7	146	731	18	10	40	1
VAN	3	7	0	10	30	1	2	29	1	0	0	0	0	0	0
FLATBED	1	1	0	0	0	0	11	178	2	20	100	4	0	0	0
PICKUP	125	314	54	8	23	3	16	266	12	43	213	19	15	61	4
AUTOMOBILE	10	25	8	0	0	0	0	0	0	1	5	1	0	0	0
VEHICLE WITH TRAILER	4	11	2	1	3	0	0	0	0	11	55	3	13	53	1
TANKER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	349	872	89	21	64	5	90	1446	22	221	1104	45	38	154	6

TYPE OF VEHICLE	PLASTICS			METALLICS			GLASS			TEXTILES			ORGANIC		
	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH
PACKER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
F.L. PACKER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
O.T. ROLLOFF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
COMP. ROLLOFF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TRANSFER TRAILER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DUMP TRUCK	0	0	0	17	50	3	2	10	0	0	1	0	5	71	1
VAN	0	0	0	2	7	1	0	0	0	5	6	2	0	0	0
FLATBED	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PICKUP	4	4	1	26	79	11	0	1	0	6	8	4	1	15	1
AUTOMOBILE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
VEHICLE WITH TRAILER	0	0	0	3	9	1	0	0	0	0	0	0	0	0	0
TANKER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	4	4	1	48	145	16	2	12	0	11	15	6	6	86	2

TYPE OF VEHICLE	FURNITURE			TOTAL		
	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH
PACKER	0	0	0	3077	6860	73
F.L. PACKER	0	0	0	0	0	0
O.T. ROLLOFF	0	0	0	0	0	0
COMP. ROLLOFF	0	0	0	0	0	0
TRANSFER TRAILER	0	0	0	0	0	0
DUMP TRUCK	1	1	0	610	2729	81
VAN	0	0	0	68	166	21
FLATBED	0	0	0	68	359	16
PICKUP	7	7	1	567	1662	289
AUTOMOBILE	0	0	0	22	53	20
VEHICLE WITH TRAILER	0	0	0	130	331	32
TANKER	0	0	0	0	0	0
TOTAL	9	9	1	4542	12159	532

NOTE: MULTIPLY ALL POUNDS SHOWN BY A FACTOR OF 100

LANDFILL SURVEY ANALYSIS PACKAGE

AS RECEIVED QUANTITIES OF REFUSE BY TYPE OF VEHICLE AND BY TYPE OF WASTE

HAMILTON SANITARY LANDFILL
SUMMARY REPORT

TYPE OF VEHICLE	RESIDENTIAL			COMMERCIAL			PAPER			CARDBOARD			WOOD		
	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH
PACKER	601	1383	15	411	905	12	0	0	0	0	0	0	0	0	0
F.L. PACKER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
O.T. ROLLOFF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
COMP. ROLLOFF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TRANSFER TRAILER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DUMP TRUCK	3	6	0	0	0	0	0	0	0	20	36	2	8	17	1
VAN	2	5	1	0	0	0	0	0	0	0	0	0	0	0	0
FLATBED	0	0	0	0	0	0	0	0	0	15	27	2	15	34	1
PICKUP	61	139	43	0	0	0	0	0	0	7	12	4	36	83	14
AUTOMOBILE	11	26	11	0	0	0	1	2	1	0	0	0	0	0	0
VEHICLE WITH TRAILER	3	7	1	0	0	0	0	0	0	0	0	0	2	5	1
TANKER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	681	1565	71	411	905	12	1	2	1	41	75	8	61	140	17

TYPE OF VEHICLE	PARK + YARD			WHITE GOODS			EARTH-ASH-FILL			CONSTRUCTION DEMO			RUBBER		
	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH
PACKER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
F.L. PACKER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
O.T. ROLLOFF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
COMP. ROLLOFF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TRANSFER TRAILER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DUMP TRUCK	3	8	1	0	0	0	0	0	0	0	0	0	0	0	0
VAN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FLATBED	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PICKUP	51	127	24	15	44	4	2	32	1	7	33	3	1	2	0
AUTOMOBILE	2	5	2	0	0	0	0	0	0	0	0	0	0	0	0
VEHICLE WITH TRAILER	8	19	2	0	0	0	2	24	1	10	50	1	0	0	0
TANKER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	63	158	29	15	44	4	4	57	2	16	83	4	1	2	0

TYPE OF VEHICLE	PLASTICS			METALLICS			GLASS			TEXTILES			ORGANIC		
	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH
PACKER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
F.L. PACKER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
O.T. ROLLOFF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
COMP. ROLLOFF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TRANSFER TRAILER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DUMP TRUCK	0	0	0	10	30	1	0	0	0	0	0	0	0	0	0
VAN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FLATBED	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PICKUP	0	0	0	6	18	2	0	0	0	0	0	0	0	0	0
AUTOMOBILE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
VEHICLE WITH TRAILER	0	0	0	1	3	1	0	0	0	0	0	0	0	0	0
TANKER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	0	17	51	4	0	0	0	0	0	0	0	0	0

TYPE OF VEHICLE	FURNITURE			TOTAL		
	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH
PACKER	0	0	0	1013	2288	27
F.L. PACKER	0	0	0	0	0	0
O.T. ROLLOFF	0	0	0	0	0	0
COMP. ROLLOFF	0	0	0	0	0	0
TRANSFER TRAILER	0	0	0	0	0	0
DUMP TRUCK	0	0	0	43	96	5
VAN	0	0	0	2	5	1
FLATBED	0	0	0	30	61	3
PICKUP	0	0	0	184	491	95
AUTOMOBILE	0	0	0	14	32	14
VEHICLE WITH TRAILER	0	0	0	25	107	7
TANKER	0	0	0	0	0	0
TOTAL	0	0	0	1311	3081	152

NOTE: MULTIPLY ALL POUNDS SHOWN BY A FACTOR OF 100

LANDFILL SURVEY ANALYSIS PACKAGE

AS RECEIVED QUANTITIES OF REFUSE BY TYPE OF VEHICLE AND BY TYPE OF WASTE

GLASGOW SANITARY LANDFILL SURVEY
SUMMARY REPORT

TYPE OF VEHICLE	RESIDENTIAL			COMMERCIAL			PAPER			CARDBOARD			WOOD		
	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH
PACKER	343	788	10	481	1057	13	0	0	0	0	0	0	0	0	0
F.L. PACKER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
O.T. ROLLOFF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
COMP. ROLLOFF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TRANSFER TRAILER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DUMP TRUCK	1	2	0	0	0	0	0	0	0	8	13	1	9	21	1
VAN	0	0	0	2	4	1	0	0	0	0	0	0	0	0	0
FLATBED	0	0	0	1	2	1	0	0	0	0	0	0	0	0	0
PICKUP	33	77	27	24	54	17	4	7	3	22	49	15	17	39	11
AUTOMOBILE	0	0	0	0	0	0	0	0	0	1	2	1	0	0	0
VEHICLE WITH TRAILER	0	0	0	0	0	0	0	0	0	0	0	0	24	55	12
TANKER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	377	867	37	508	1118	32	4	7	3	31	55	17	50	114	24

TYPE OF VEHICLE	PARK + YARD			WHITE GOODS			EARTH-ASH-FILL			CONSTRUCTION DEMO			RUBBER		
	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH
PACKER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
F.L. PACKER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
O.T. ROLLOFF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
COMP. ROLLOFF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TRANSFER TRAILER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DUMP TRUCK	315	788	33	0	0	0	7	119	1	120	600	13	0	0	0
VAN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FLATBED	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PICKUP	119	297	52	1	2	0	14	226	10	20	102	10	0	0	0
AUTOMOBILE	3	8	3	0	0	0	0	0	0	0	0	0	0	0	0
VEHICLE WITH TRAILER	4	10	2	0	0	0	0	0	0	6	30	3	0	0	0
TANKER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	441	1102	90	1	2	0	21	344	11	146	732	26	0	0	0

TYPE OF VEHICLE	PLASTICS			METALLICS			GLASS			TEXTILES			ORGANIC		
	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH
PACKER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
F.L. PACKER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
O.T. ROLLOFF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
COMP. ROLLOFF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TRANSFER TRAILER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DUMP TRUCK	3	2	0	5	15	0	0	0	0	0	0	0	3	37	1
VAN	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0
FLATBED	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PICKUP	0	0	0	5	15	4	0	0	0	0	0	0	2	24	1
AUTOMOBILE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
VEHICLE WITH TRAILER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TANKER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	3	2	0	10	30	4	0	0	0	1	1	1	5	61	2

TYPE OF VEHICLE	FURNITURE			TOTAL		
	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH
PACKER	0	0	0	823	1845	23
F.L. PACKER	0	0	0	0	0	0
O.T. ROLLOFF	0	0	0	0	0	0
COMP. ROLLOFF	0	0	0	0	0	0
TRANSFER TRAILER	0	0	0	0	0	0
DUMP TRUCK	0	0	0	470	1596	50
VAN	0	0	0	3	6	2
FLATBED	0	0	0	1	2	1
PICKUP	4	4	2	265	886	152
AUTOMOBILE	0	0	0	4	9	4
VEHICLE WITH TRAILER	0	0	0	34	95	17
TANKER	0	0	0	0	0	0
TOTAL	4	4	2	1600	4440	249

NOTE: MULTIPLY ALL POUNDS SHOWN BY A FACTOR OF 100

LANDFILL SURVEY ANALYSIS PACKAGE

AS RECEIVED QUANTITIES OF REFUSE BY TYPE OF VEHICLE AND BY TYPE OF WASTE

BUTTE LANDFILL SURVEY
SUMMARY REPORT

TYPE OF VEHICLE	RESIDENTIAL			COMMERCIAL			PAPER			CARDBOARD			WOOD		
	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH
PACKER	2558	5884	55	0	0	0	0	0	0	0	0	0	31	72	1
F.L. PACKER	0	0	0	1872	4118	32	0	0	0	0	0	0	0	0	0
O.T. ROLLOFF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
COMP. ROLLOFF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TRANSFER TRAILER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DUMP TRUCK	14	32	2	29	64	7	4	7	1	72	130	12	30	70	4
VAN	11	25	8	5	12	1	3	5	1	77	139	21	3	7	0
FLATBED	0	0	0	2	5	0	0	0	0	26	47	5	13	30	4
PICKUP	546	1256	406	39	86	25	13	24	11	170	307	95	298	686	172
AUTOMOBILE	91	209	88	0	0	0	7	12	7	3	5	2	7	17	7
VEHICLE WITH TRAILER	19	45	11	0	0	0	1	1	0	7	13	4	6	13	2
TANKER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	3239	7450	570	1948	4285	65	27	48	20	356	641	139	389	895	190

TYPE OF VEHICLE	PARK + YARD			WHITE GOODS			EARTH-ASH-FILL			CONSTRUCTION DEMO			RUBBER		
	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH
PACKER	48	120	1	0	0	0	0	0	0	48	240	1	0	0	0
F.L. PACKER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
O.T. ROLLOFF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
COMP. ROLLOFF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TRANSFER TRAILER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DUMP TRUCK	47	118	10	0	0	0	38	622	7	26	129	6	0	0	0
VAN	10	25	7	2	5	1	0	0	0	0	0	0	0	0	0
FLATBED	6	14	2	0	0	0	9	137	2	11	55	3	0	2	0
PICKUP	633	1583	374	33	99	18	78	1255	53	79	393	50	14	55	5
AUTOMOBILE	90	224	89	2	6	2	1	16	1	3	14	3	2	6	1
VEHICLE WITH TRAILER	27	68	16	0	0	0	3	52	2	5	25	3	0	0	0
TANKER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	861	2153	499	36	109	21	129	2082	65	171	855	66	16	62	6

TYPE OF VEHICLE	PLASTICS			METALLICS			GLASS			TEXTILES			ORGANIC		
	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH
PACKER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
F.L. PACKER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
O.T. ROLLOFF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
COMP. ROLLOFF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TRANSFER TRAILER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DUMP TRUCK	0	0	0	4	10	0	0	0	0	0	0	0	12	163	2
VAN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FLATBED	0	0	0	15	45	3	0	0	0	0	0	0	0	0	0
PICKUP	1	1	1	166	498	43	7	52	4	14	20	9	3	41	3
AUTOMOBILE	1	1	1	6	19	4	2	14	2	4	6	4	2	27	2
VEHICLE WITH TRAILER	0	0	0	0	0	0	0	0	0	0	0	0	2	27	2
TANKER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	2	2	2	191	572	50	9	66	6	18	26	13	19	258	9

TYPE OF VEHICLE	FURNITURE			TOTAL		
	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH
PACKER	0	0	0	2686	6316	58
F.L. PACKER	0	0	0	1872	4118	32
O.T. ROLLOFF	0	0	0	0	0	0
COMP. ROLLOFF	0	0	0	0	0	0
TRANSFER TRAILER	0	0	0	0	0	0
DUMP TRUCK	0	0	0	277	1346	51
VAN	12	12	2	122	228	41
FLATBED	0	0	0	82	335	19
PICKUP	41	41	21	2135	6394	1290
AUTOMOBILE	2	2	2	222	578	215
VEHICLE WITH TRAILER	2	2	1	72	246	41
TANKER	0	0	0	0	0	0
TOTAL	56	56	26	7468	19561	1747

NOTE: MULTIPLY ALL POUNDS SHOWN BY A FACTOR OF 100

LANDFILL SURVEY ANALYSIS PACKAGE

AS RECEIVED QUANTITIES OF REFUSE BY TYPE OF VEHICLE AND BY TYPE OF WASTE

MILES CITY SANITARY LANDFILL SURVEY
SUMMARY REPORT

TYPE OF VEHICLE	RESIDENTIAL CU YDS	RESIDENTIAL POUNDS	RESIDENTIAL VEH	COMMERCIAL CU YDS	COMMERCIAL POUNDS	COMMERCIAL VEH	PAPER CU YDS	PAPER POUNDS	PAPER VEH	CARDBOARD CU YDS	CARDBOARD POUNDS	CARDBOARD VEH	WOOD CU YDS	WOOD POUNDS	WOOD VEH
PACKER	768	1766	17	444	977	9	0	0	0	0	0	0	0	0	0
F.L. PACKER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
O.T. ROLLOFF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
COMP. ROLLOFF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TRANSFER TRAILER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DUMP TRUCK	0	0	0	25	55	3	0	0	0	10	18	1	25	58	2
VAN	1	2	1	0	0	0	0	0	0	0	0	0	0	0	0
FLATBED	2	5	1	12	26	3	12	22	2	14	25	2	15	34	2
PICKUP	72	166	58	34	75	19	3	4	3	10	17	4	30	69	16
AUTOMOBILE	11	25	11	0	0	0	0	0	0	0	0	0	0	0	0
VEHICLE WITH TRAILER	0	0	0	0	0	0	0	0	0	2	4	0	5	11	2
TANKER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	854	1965	88	515	1133	34	14	26	5	35	64	7	75	173	22

TYPE OF VEHICLE	PARK + YARD CU YDS	PARK + YARD POUNDS	PARK + YARD VEH	WHITE GOODS CU YDS	WHITE GOODS POUNDS	WHITE GOODS VEH	EARTH-ASH-FILL CU YDS	EARTH-ASH-FILL POUNDS	EARTH-ASH-FILL VEH	CONSTRUCTION DEMO CU YDS	CONSTRUCTION DEMO POUNDS	CONSTRUCTION DEMO VEH	RUBBER CU YDS	RUBBER POUNDS	RUBBER VEH
PACKER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
F.L. PACKER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
O.T. ROLLOFF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
COMP. ROLLOFF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TRANSFER TRAILER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DUMP TRUCK	76	190	7	0	0	0	180	2907	19	0	0	0	0	0	0
VAN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FLATBED	70	175	7	0	0	0	0	0	0	36	180	5	0	0	0
PICKUP	157	393	71	1	2	0	3	40	1	14	69	7	19	76	3
AUTOMOBILE	2	5	2	0	0	0	0	0	0	0	0	0	0	0	0
VEHICLE WITH TRAILER	25	63	8	0	0	0	3	48	1	1	5	1	0	0	0
TANKER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	330	825	95	1	2	0	185	2996	21	51	254	13	19	76	3

TYPE OF VEHICLE	PLASTICS CU YDS	PLASTICS POUNDS	PLASTICS VEH	METALLICS CU YDS	METALLICS POUNDS	METALLICS VEH	GLASS CU YDS	GLASS POUNDS	GLASS VEH	TEXTILES CU YDS	TEXTILES POUNDS	TEXTILES VEH	ORGANIC CU YDS	ORGANIC POUNDS	ORGANIC VEH
PACKER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
F.L. PACKER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
O.T. ROLLOFF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
COMP. ROLLOFF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TRANSFER TRAILER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DUMP TRUCK	0	0	0	96	288	10	0	0	0	0	0	0	0	0	0
VAN	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0
FLATBED	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PICKUP	0	0	0	1	4	1	0	0	0	0	0	0	0	0	0
AUTOMOBILE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
VEHICLE WITH TRAILER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TANKER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	0	97	292	11	0	0	0	1	1	1	0	0	0

TYPE OF VEHICLE	FURNITURE CU YDS	FURNITURE POUNDS	FURNITURE VEH	TOTAL CU YDS	TOTAL POUNDS	TOTAL VEH
PACKER	0	0	0	1212	2743	26
F.L. PACKER	0	0	0	0	0	0
O.T. ROLLOFF	0	0	0	0	0	0
COMP. ROLLOFF	0	0	0	0	0	0
TRANSFER TRAILER	0	0	0	0	0	0
DUMP TRUCK	0	0	0	412	3515	42
VAN	0	0	0	2	4	2
FLATBED	0	0	0	161	467	22
PICKUP	4	4	2	347	920	185
AUTOMOBILE	0	0	0	13	30	13
VEHICLE WITH TRAILER	0	0	0	36	131	12
TANKER	0	0	0	0	0	0
TOTAL	4	4	2	2183	7811	302

NOTE: MULTIPLY ALL POUNDS SHOWN BY A FACTOR OF 100

LANDFILL SUPVEY ANALYSIS PACKAGE

AS RECEIVED QUANTITIES OF REFUSE BY TYPE OF VEHICLE AND BY TYPE OF WASTE

MISSOULA LANDFILL SURVEY
SUMMARY REPORT

TYPE OF VEHICLE	RESIDENTIAL			COMMERCIAL			PAPER			CARDBOARD			WOOD		
	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH
PACKER	5625	12937	100	60	132	1	0	0	0	0	0	0	0	0	0
F.L. PACKER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
O.T. ROLLOFF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
COMP. ROLLOFF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TRANSFER TRAILER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DUMP TRUCK	0	0	0	0	0	0	0	0	0	31	56	4	192	443	19
VAN	5	11	2	0	0	0	18	32	2	25	45	3	10	23	1
FLATBED	9	21	2	0	0	0	4	6	2	13	23	1	23	54	3
PICKUP	156	358	81	3	8	1	6	11	4	34	61	17	60	138	22
AUTOMOBILE	13	31	11	0	0	0	0	0	0	3	5	2	0	0	0
VEHICLE WITH TRAILER	5	13	3	0	0	0	0	0	0	43	78	1	30	68	1
TANKER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	5814	13371	199	63	140	2	28	50	8	149	269	28	316	726	46

TYPE OF VEHICLE	PARK + YARD			WHITE GOODS			EARTH-ASH-FILL			CONSTRUCTION DEMO			RUBBER		
	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH
PACKER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
F.L. PACKER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
O.T. ROLLOFF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
COMP. ROLLOFF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TRANSFER TRAILER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DUMP TRUCK	68	170	6	15	45	1	3	48	1	20	100	2	30	120	2
VAN	2	6	1	0	0	0	0	0	0	0	0	0	0	0	0
FLATBED	0	0	0	0	0	0	0	0	0	6	29	2	0	0	0
PICKUP	125	314	64	10	31	5	2	36	1	23	113	9	2	8	0
AUTOMOBILE	2	4	1	0	0	0	0	0	0	0	0	0	0	0	0
VEHICLE WITH TRAILER	10	26	5	0	0	0	0	0	0	5	25	3	0	0	0
TANKER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	208	519	77	25	76	6	5	84	2	53	266	16	32	128	2

TYPE OF VEHICLE	PLASTICS			METALLICS			GLASS			TEXTILES			ORGANIC		
	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH
PACKER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
F.L. PACKER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
O.T. ROLLOFF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
COMP. ROLLOFF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TRANSFER TRAILER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DUMP TRUCK	7	7	1	18	55	4	0	0	0	0	0	0	0	0	0
VAN	0	0	0	0	0	0	0	0	0	7	10	1	1	14	0
FLATBED	0	0	0	64	192	7	0	0	0	5	7	2	0	0	0
PICKUP	0	0	0	21	62	9	1	7	1	9	13	4	0	0	0
AUTOMOBILE	0	0	0	1	3	1	0	0	0	0	0	0	0	0	0
VEHICLE WITH TRAILER	0	0	0	6	17	3	0	0	0	0	0	0	0	0	0
TANKER	0	0	0	0	0	0	0	0	0	0	0	0	65	884	3
TOTAL	7	7	1	110	329	24	1	7	1	21	30	7	66	898	3

TYPE OF VEHICLE	FURNITURE			TOTAL		
	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH
PACKER	0	0	0	5685	13069	101
F.L. PACKER	0	0	0	0	0	0
O.T. ROLLOFF	0	0	0	0	0	0
COMP. ROLLOFF	0	0	0	0	0	0
TRANSFER TRAILER	0	0	0	0	0	0
DUMP TRUCK	5	5	0	390	1049	40
VAN	1	1	1	69	141	11
FLATBED	0	0	0	124	333	19
PICKUP	12	12	4	464	1170	222
AUTOMOBILE	0	0	0	19	43	15
VEHICLE WITH TRAILER	2	2	1	102	230	17
TANKER	0	0	0	65	884	3
TOTAL	20	20	6	6918	16920	428

NOTE: MULTIPLY ALL POUNDS SHOWN BY A FACTOR OF 100

LANDFILL SURVEY ANALYSIS PACKAGE

AS RECEIVED QUANTITIES OF REFUSE BY TYPE OF VEHICLE AND BY TYPE OF WASTE

KALISPELL LANDFILL SURVEY
SUMMARY REPORT

TYPE OF VEHICLE	RESIDENTIAL			COMMERCIAL			PAPER			CARDBOARD			WOOD		
	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH
PACKER	2456	5650	55	1320	2904	34	0	0	0	0	0	0	25	57	1
F.L. PACKER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
O.T. ROLLOFF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
COMP. ROLLOFF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TRANSFER TRAILER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DUMP TRUCK	24	55	6	3	6	1	5	10	1	2	3	0	65	150	11
VAN	30	70	25	4	8	2	13	24	4	33	59	11	26	61	4
FLATBED	18	40	4	2	4	1	1	1	1	3	4	0	24	55	8
PICKUP	524	1205	350	14	31	10	28	50	14	33	59	19	166	381	74
AUTOMOBILE	124	286	114	2	4	1	5	8	4	1	2	1	3	6	1
VEHICLE WITH TRAILER	75	173	20	4	9	1	0	0	0	70	126	10	26	61	6
TANKER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	3252	7479	574	1348	2967	50	52	93	24	141	254	41	335	770	105

TYPE OF VEHICLE	PARK + YARD			WHITE GOODS			EARTH-ASH-FILL			CONSTRUCTION DEMO			RUBBER		
	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH
PACKER	3	7	0	0	0	0	0	0	0	0	0	0	0	0	0
F.L. PACKER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
O.T. ROLLOFF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
COMP. ROLLOFF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TRANSFER TRAILER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DUMP TRUCK	37	93	8	1	2	0	5	81	0	55	277	10	16	64	1
VAN	10	24	4	5	15	1	0	0	0	0	0	0	0	0	0
FLATBED	4	10	1	0	1	0	0	0	0	10	52	2	4	14	1
PICKUP	172	430	89	10	31	6	2	37	1	33	165	20	52	210	11
AUTOMOBILE	5	13	3	1	2	1	0	0	0	0	0	0	0	0	0
VEHICLE WITH TRAILER	37	93	14	4	12	1	0	0	0	3	15	1	0	1	0
TANKER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	268	669	119	21	63	9	7	118	1	102	509	33	72	288	13

TYPE OF VEHICLE	PLASTICS			METALLICS			GLASS			TEXTILES			ORGANIC		
	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH
PACKER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
F.L. PACKER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
O.T. ROLLOFF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
COMP. ROLLOFF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TRANSFER TRAILER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DUMP TRUCK	0	0	0	19	56	5	0	0	0	4	6	1	70	956	17
VAN	0	0	0	3	8	1	0	0	0	1	1	1	0	0	0
FLATBED	0	0	0	6	19	2	0	0	0	0	0	0	3	41	3
PICKUP	4	3	1	63	188	26	1	7	1	3	4	2	10	129	9
AUTOMOBILE	0	0	0	0	0	0	0	0	0	0	0	0	1	14	1
VEHICLE WITH TRAILER	0	0	0	7	21	4	0	0	0	0	0	0	0	0	0
TANKER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	4	3	1	97	292	38	1	7	1	8	11	4	84	1140	30

TYPE OF VEHICLE	FURNITURE			TOTAL		
	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH
PACKER	0	0	0	3804	8618	90
F.L. PACKER	0	0	0	0	0	0
O.T. ROLLOFF	0	0	0	0	0	0
COMP. ROLLOFF	0	0	0	0	0	0
TRANSFER TRAILER	0	0	0	0	0	0
DUMP TRUCK	0	0	0	306	1758	61
VAN	0	0	0	125	271	53
FLATBED	2	2	0	76	244	23
PICKUP	31	31	13	1145	2962	646
AUTOMOBILE	4	4	4	145	338	130
VEHICLE WITH TRAILER	1	1	0	229	511	57
TANKER	0	0	0	0	0	0
TOTAL	38	38	17	5829	14702	1060

NOTE: MULTIPLY ALL POUNDS SHOWN BY A FACTOR OF 100

LANDFILL SURVEY ANALYSIS PACKAGE

AS RECEIVED QUANTITIES OF REFUSE BY TYPE OF VEHICLE AND BY TYPE OF WASTE

HELENA LANDFILL SURVEY
SUMMARY REPORT

TYPE OF VEHICLE	RESIDENTIAL			COMMERCIAL			PAPER			CARDBOARD			WOOD		
	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH
PACKER	1596	3670	46	604	1329	15	0	0	0	35	62	0	0	0	0
F.L. PACKER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
O.T. ROLLOFF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
COMP. ROLLOFF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TRANSFER TRAILER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DUMP TRUCK	55	127	9	12	26	1	13	23	3	12	21	3	44	102	5
VAN	9	21	11	13	29	7	84	150	6	11	20	6	9	21	5
FLATBED	14	31	8	17	37	2	8	15	2	20	36	7	65	148	12
PICKUP	151	346	147	17	38	15	58	105	24	57	103	40	87	200	58
AUTOMOBILE	12	28	22	0	0	0	4	7	4	5	9	4	0	0	1
VEHICLE WITH TRAILER	8	19	6	1	2	1	2	3	1	2	4	0	10	22	6
TANKER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	1844	4242	249	664	1461	41	168	302	40	142	255	60	215	494	87

TYPE OF VEHICLE	PARK + YARD			WHITE GOODS			EARTH-ASH-FILL			CONSTRUCTION DEMO			RUBBER		
	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH
PACKER	0	0	0	0	0	0	1	14	1	0	0	0	0	0	0
F.L. PACKER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
O.T. ROLLOFF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
COMP. ROLLOFF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TRANSFER TRAILER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DUMP TRUCK	69	174	16	1	2	0	27	442	8	45	225	11	6	23	2
VAN	2	4	3	1	4	1	2	31	4	0	0	0	3	12	1
FLATBED	21	51	8	4	13	0	19	309	12	32	160	13	1	3	0
PICKUP	146	365	116	14	43	14	28	445	47	46	231	52	9	37	9
AUTOMOBILE	1	4	2	0	0	0	0	0	0	1	8	4	0	0	0
VEHICLE WITH TRAILER	11	27	8	0	0	0	0	4	1	1	6	2	0	0	0
TANKER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	250	625	153	20	61	15	77	1245	73	126	630	82	19	75	12

TYPE OF VEHICLE	PLASTICS			METALLICS			GLASS			TEXTILES			ORGANIC		
	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH
PACKER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
F.L. PACKER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
O.T. ROLLOFF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
COMP. ROLLOFF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TRANSFER TRAILER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DUMP TRUCK	0	0	0	10	31	3	0	0	0	0	0	0	0	0	0
VAN	0	0	0	1	4	1	0	2	1	3	4	3	0	0	0
FLATBED	0	0	0	10	29	3	0	0	0	1	2	0	0	0	0
PICKUP	1	1	1	23	69	22	2	12	2	12	17	7	1	16	1
AUTOMOBILE	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0
VEHICLE WITH TRAILER	0	0	0	1	3	1	0	0	0	0	0	0	0	0	0
TANKER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	1	1	1	46	138	30	2	14	3	16	22	10	1	16	1

TYPE OF VEHICLE	FURNITURE			TOTAL		
	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH
PACKER	0	0	0	2235	5075	62
F.L. PACKER	0	0	0	0	0	0
O.T. ROLLOFF	0	0	0	0	0	0
COMP. ROLLOFF	0	0	0	0	0	0
TRANSFER TRAILER	0	0	0	0	0	0
DUMP TRUCK	0	0	0	294	1196	61
VAN	0	0	0	138	302	49
FLATBED	0	0	0	210	833	67
PICKUP	0	0	0	652	2028	555
AUTOMOBILE	0	0	0	24	57	37
VEHICLE WITH TRAILER	0	0	0	37	92	26
TANKER	0	0	0	0	0	0
TOTAL	0	0	0	3591	9582	857

NOTE: MULTIPLY ALL POUNDS SHOWN BY A FACTOR OF 100

LANDFILL SURVEY ANALYSIS PACKAGE

AS RECEIVED QUANTITIES OF REFUSE BY TYPE OF VEHICLE AND BY TYPE OF WASTE

GREAT FALLS SANITARY LANDFILL SURVEY
SUMMARY REPORT

TYPE OF VEHICLE	RESIDENTIAL			COMMERCIAL			PAPER			CARDBOARD			WOOD		
	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH
PACKER	123	283	4	316	696	8	0	0	0	0	0	0	0	0	0
F.L. PACKER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
O.T. ROLLOFF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
COMP. ROLLOFF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TRANSFER TRAILER	0	0	0	0	0	0	0	0	0	15	27	1	0	0	0
DUMP TRUCK	0	0	0	51	112	6	0	0	0	55	99	6	57	131	6
VAN	3	7	3	13	29	3	0	0	0	227	409	35	22	51	4
FLATBED	15	34	2	34	75	5	7	13	1	27	49	4	31	71	3
PICKUP	69	158	47	107	236	55	4	7	3	93	168	50	110	253	55
AUTOMOBILE	2	5	2	0	0	0	1	2	2	2	4	1	2	5	2
VEHICLE WITH TRAILER	2	3	1	5	10	1	0	0	0	5	10	2	20	47	5
TANKER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	213	491	59	526	1158	78	12	22	6	425	765	99	242	557	75

TYPE OF VEHICLE	PARK + YARD			WHITE GOODS			EARTH-ASH-FILL			CONSTRUCTION DEMO			RUBBER		
	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH
PACKER	0	0	0	0	0	0	0	0	0	0	0	0	36	144	1
F.L. PACKER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
O.T. ROLLOFF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
COMP. ROLLOFF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TRANSFER TRAILER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DUMP TRUCK	260	651	27	3	8	0	182	2947	20	297	1485	34	87	348	6
VAN	1	3	1	0	0	0	0	0	0	5	25	1	0	0	0
FLATBED	24	60	4	0	0	0	5	81	1	18	90	3	0	0	0
PICKUP	469	1173	230	21	62	8	20	327	13	97	487	50	86	344	15
AUTOMOBILE	18	45	18	2	6	2	0	0	0	0	0	0	0	0	0
VEHICLE WITH TRAILER	46	116	19	5	13	2	2	32	1	9	43	4	0	0	0
TANKER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	819	2048	299	30	89	12	210	3387	35	426	2129	92	209	836	22

TYPE OF VEHICLE	PLASTICS			METALLICS			GLASS			TEXTILES			ORGANIC		
	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH
PACKER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
F.L. PACKER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
O.T. ROLLOFF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
COMP. ROLLOFF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TRANSFER TRAILER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DUMP TRUCK	0	0	0	16	48	2	0	0	0	0	0	0	0	0	0
VAN	0	0	0	0	0	0	0	0	0	28	40	3	1	14	1
FLATBED	0	0	0	4	12	1	0	0	0	0	0	0	0	0	0
PICKUP	0	0	0	28	84	17	0	0	0	10	15	6	9	122	8
AUTOMOBILE	0	0	0	0	0	0	0	0	0	2	2	2	0	0	0
VEHICLE WITH TRAILER	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0
TANKER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	0	48	144	20	0	0	0	41	58	11	10	136	9

TYPE OF VEHICLE	FURNITURE			TOTAL		
	CU YDS	POUNDS	VEH	CU YDS	POUNDS	VEH
PACKER	0	0	0	475	1123	13
F.L. PACKER	0	0	0	0	0	0
O.T. ROLLOFF	0	0	0	0	0	0
COMP. ROLLOFF	0	0	0	0	0	0
TRANSFER TRAILER	0	0	0	15	27	1
DUMP TRUCK	3	3	0	1011	5832	107
VAN	0	0	0	301	577	51
FLATBED	0	0	0	165	485	24
PICKUP	33	33	16	1157	3469	573
AUTOMOBILE	2	2	2	31	70	31
VEHICLE WITH TRAILER	0	0	0	94	276	35
TANKER	0	0	0	0	0	0
TOTAL	37	37	18	3249	11858	835

NOTE: MULTIPLY ALL POUNDS SHOWN BY A FACTOR OF 100

APPENDIX C

SOLID WASTE

SAMPLING RESULTS

BILLINGS SOLID WASTE SURVEY

Sample No.	Combustibles								Non-Combustibles				
	Paper	Card Board	Plastic	Cloth	Wood	Yard	Food	Sub Total	Ferrous	Aluminum	Glass	Sub Total	Total
1 lbs	51-3	6-0	9-10	26-15	1-10	4-14	6-12	107-0	13-10	2-3	11-5	27-2	134-2
2 lbs	23-8	2-12	6-12	0-12	0-0	0-0	20-9	54-5	25-11	0-3	6-11	32-9	86-14
3 lbs	42-12	4-4	3-5	7-14	0-0	0-0	12-10	70-13	5-12	1-3	5-14	12-13	83-10
4 lbs	19-8	6-4	6-8	2-4	0-0	0-0	24-14	59-6	8-0	1-6	5-0	14-6	73-12
5 lbs	30-1	7-9	5-8	1-4	0-0	0-0	24-8	68-14	9-6	1-8	7-12	18-10	87-8
6 lbs	31-4	15-0	5-15	5-8	0-0	18-14	32-4	108-13	14-10	2-4	7-0	23-14	132-11
7 lbs	31-12	18-12	9-1	7-0	0-0	7-0	44-8	118-1	7-4	4-2	24-4	35-10	153-11
8 lbs	28-0	10-1	12-14	5-12	0-0	0-0	34-8	91-3	8-8	3-4	8-4	20-0	111-3
9 lbs	26-10	12-0	7-12	3-8	0-0	27-10	26-8	104-0	14-6	2-0	19-0	35-6	139-6
10 lbs	12-0	9-6	5-9	5-3	0-0	13-4	19-11	90-7	11-10	2-14	12-8	27-0	117-7
11 lbs	12-1	22-0	5-0	7-8	0-0	1-3	17-4	65-10	7-4	2-8	8-10	18-6	84-0
12 lbs	11-4	18-12	8-8	2-4	10-8	12-3	39-12	103-3	10-9	2-12	11-2	24-7	127-10
13 lbs	35-4	11-8	7-9	22-6	7-2	25-12	51-0	160-9	18-18	2-6	10-0	31-8	192-1
14 lbs	43-15	14-12	11-8	16-2	2-3	118-4	27-14	234-10	9-14	3-0	14-9	27-7	262-1
15 lbs	41-8	15-13	5-12	3-0	0-0	0-0	5-0	71-1	8-5	2-9	2-10	13-8	84-9
16 lbs	46-10	32-3	15-16	5-13	0-0	22-2	32-10	154-12	10-8	2-6	19-12	32-10	187-6
Total	512-10	207-0	126-9	123-1	21-7	251-2	420-14	1662-11	184-7	36-8	174-5	395-4	2057-15
Average Percent	24.9	10.1	6.1	6.0	1.0	12.2	20.5	80.8	9.0	1.8	8.4	19.2	100.0

GREAT FALLS SOLID WASTE SAMPLING SURVEY

Sample No.		Combustibles								Non-Combustibles				
		Paper	Card Board	Plastic	Cloth	Wood	Yard	Food	Sub Total	Ferrous	Aluminum	Glass	Sub Total	Total
1	lbs	68-4	21-0	8-0	0-8	3-0	27-10	27-10	156-0	10-4	3-4	9-8	23-0	179-0
2	lbs	64-2	24-4	10-0	12-2	6-12	82-4	53-8	253-0	29-4	7-7	15-5	52-0	305-0
3	lbs	87-9	25-1	16-0	10-3	0-12	107-3	22-5	269-1	19-6	7-6	18-7	45-3	314-4
4	lbs	97-8	34-14	17-5	13-4	4-8	234-8	33-6	435-5	29-15	5-8	32-9	68-0	503-5
5	lbs	26-3	7-4	3-8	5-6	0-0	3-12	3-12	49-13	3-3	1-8	5-10	10-5	60-2
6	lbs	48-6	6-12	8-8	0-8	1-2	62-2	21-12	149-2	9-10	2-1	10-0	21-11	170-13
7	lbs	75-5	21-14	12-9	7-6	12-8	7-0	81-10	218-4	22-7	4-4	17-5	44-0	262-4
8	lbs	70-15	20-8	7-8	4-3	2-8	36-15	29-9	172-2	10-12	2-9	20-12	34-1	206-3
Total		538-4	161-9	83-6	53-8	31-2	561-6	273-8	1702-11	134-13	33-15	129-8	298-4	2000-15
Average Percent		26.9	8.1	4.2	2.7	1.5	28.0	13.6	85.1	6.7	1.7	6.5	14.9	100.0

MISSOULA SOLID WASTE SAMPLING SURVEY

Sample No		Combustibles								Non-Combustible				
		Paper	Card Board	Plastic	Cloth	Wood	Yard	Food	Sub Total	Ferrous	Aluminum	Glass	Sub Total	Total
1	lbs	43-4	24-10	4-12	9-14	1-4	31-8	10-8	125-12	9-0	2-0	12-2	23-2	148-14
2	lbs	68-4	23-12	11-4	5-12	6-2	84-9	28-3	227-14	23-4	4-5	17-0	44-9	272-7
3	lbs	121-2	48-10	24-4	23-0	15-5	267-10	73-6	573-5	30-4	4-4	16-8	51-0	624-5
4	lbs	76-14	35-13	5-12	10-4	1-6	3-12	40-1	173-14	4-4	-15	9-5	14-8	188-6
5	lbs	51-14	30-0	8-4	3-0	6-0	82-8	19-6	201-0	12-2	6-8	5-10	24-4	225-4
6	lbs	62-14	14-10	11-0	3-12	7-4	10-6	30-10	140-8	29-8	1-10	15-12	46-14	187-6
7	lbs	25-0	13-4	12-6	0-0	2-12	54-4	25-8	133-2	4-10	3-8	6-8	14-10	147-12
8	lbs	33-8	9-2	5-5	7-5	1-0	36-2	21-10	114-0	6-12	3-13	13-5	23-14	137-14
Total		482-12	199-13	82-15	62-15	41-1	570-11	249-4	1689-7	119-12	26-15	96-2	242-13	1932-4
Average Percent		25.0	10.3	4.3	3.2	2.2	29.6	12.9	87.5	6.2	1.4	4.9	12.5	100.0

BUTTE SOLID WASTE SAMPLING SURVEY

Sample No.	Combustibles								Non-Combustibles				
	Paper	Card Board	Plastic	Cloth	Wood	Yard	Food	Sub Total	Ferrous	Aluminum	Glass	Sub Total	Total
1 lbs	25-12	5-14	6-0	1-12	0-0	19-0	15-0	73-6	6-12	-12	16-12	24-4	,97-10
2 lbs	27-8	7-12	5-14	1-12	0-0	20-0	28-2	91-0	9-0	1-0	5-0	15-0	106-0
3 lbs	16-2	4-0	5-12	2-4	0-0	9-12	33-0	71-8	6-8	2-8	10-4	19-4	90-12
4 lbs	39-4	7-12	10-0	2-0	0-0	32-0	24-8	115-8	17-4	3-0	5-0	25-4	140-12
5 lbs	31-8	5-4	4-12	3-8	0-0	9-8	19-4	73-12	6-10	3-0	7-8	17-2	90-14
6 lbs	23-12	6-12	4-8	1-0	0-0	12-8	16-8	65-0	4-8	2-0	5-4	11-12	76-12
7 lbs	33-6	8-4	7-12	3-4	0-0	15-0	21-8	89-2	10-4	2-4	30-8	43-0	132-2
8 lbs	39-4	31-0	6-0	0-0	0-0	15-0	21-8	112-12	13-12	1-0	12-12	27-8	140-4
9 lbs	23-0	4-12	11-14	10-6	-8	36-0	31-8	118-0	13-4	4-3	4-0	22-1	140-1
10 lbs	31-8	8-5	8-14	1-13	0-0	15-14	22-8	88-14	11-4	1-10	19-0	31-14	120-12
11 lbs	24-4	9-14	6-6	4-0	1-0	20-3	24-4	89-15	14-10	5-12	13-4	33-10	123-9
12 lbs	32-12	7-0	5-8	4-3	0-0	17-0	34-10	101-1	8-0	3-10	13-1	24-14	124-15
13 lbs	30-8	8-0	5-10	18-13	0-0	19-0	21-12	103-10	14-12	5-0	20-12	40-8	144-2
14 lbs	8-4	5-4	5-4	17-0	-12	14-0	11-10	62-2	11-2	1-3	10-8	22-13	84-15
15 lbs	25-0	5-12	6-4	1-8	0-0	2-4	24-14	65-10	7-12	7-0	3-0	17-12	83-6
16 lbs	23-4	6-8	8-4	0-0	0-0	12-2	55-0	105-2	9-0	1-4	8-4	18-8	123-10
17 lbs	32-0	5-0	8-0	3-0	0-0	12-4	24-4	84-8	9-4	3-0	15-8	27-12	112-4
18 lbs	25-12	5-0	5-0	2-8	0-0	8-10	12-4	59-2	8-8	1-12	19-0	29-4	88-6
Total	493-6	142-1	121-10	78-10	2-4	290-1	442-0	1570-0	182-2	49-14	220-2	452-2	2022-2
Average Percent	24.3	7.0	6.1	3.9	0.1	14.3	21.9	77.6	9.0	2.5	10.9	22.4	100.0

APPENDIX D

SOLID WASTE

LABORATORY RESULTS

NORTHERN TESTING LABORATORIES

GREAT FALLS • BILLINGS MONTANA • BOISE IDAHO • GILLETTE WYOMING

Report of: Solid Waste Analysis

Date September 15, 1975
Job Number 75-150
Sheet 1 of 1

Report to: HENNINGSON, DURHAM & RICHARDSON (4)
2225 ELEVENTH AVENUE
HELENA MT 59601

Sample Identification:

On August 28, 1975, eight samples of solid waste from Missoula were delivered to our laboratory for analysis. The results are as follows:

TEST RESULTS:

Lab No.	49059	49060	49061	49062	49063	49064	49065	49066
Component								
Sample Weight, lbs.	8.20	8.44	6.10	5.50	7.95	4.89	5.44	12.05
Ferrous Metal, %	5.0	6.1	4.0	2.6	0.0	0.0	6.9	2.2
Aluminum Metal, %	1.9	0.4	1.3	0.0	0.05	0.3	0.1	0.5
Glass, %	0.6	8.2	7.3	0.0	17.9	1.6	0.0	0.0
Moisture, %	29.0	59.1	42.2	35.9	19.9	29.0	32.7	54.5
Residue at 600°C, %	13.60	13.00	11.55	22.50	12.12	7.86	8.78	16.71
Carbon, %	41.10	44.13	45.84	40.36	43.24	49.83	45.38	39.98
Hydrogen, %	5.74	6.41	6.45	5.74	6.43	6.98	6.30	5.47
Nitrogen, %	0.32	1.32	1.45	1.60	0.29	0.41	0.40	1.25
Sulfur, %	0.11	0.12	0.23	0.17	0.06	0.13	0.05	0.09
Chlorine, %	0.38	0.48	0.22	0.23	0.09	1.43	1.46	0.47
Oxygen, %	38.75	34.54	34.26	29.40	37.77	33.36	37.63	36.03
BTU/lb., As Received	5,032	3,252	4,785	4,627	5,987	6,782	5,335	2,946
BTU/lb., Dry	7,087	7,952	8,279	7,219	7,474	9,552	7,927	6,475

Certified Leland J. Thelen

NORTHERN TESTING LABORATORIES

GREAT FALLS • BILLINGS MONTANA • BOISE IDAHO • GILLETTE WYOMING

Report of: Solid Waste Analysis

Date September 19, 1975
Job Number 75-150
Sheet 1 of 1

Report to: HENNINGSON DURHAM & RICHARDSON (4)
2225 ELEVENTH AVENUE
HELENA MT 59601

Sample Identification:

On September 11 and 12, 1975, ten samples of solid waste from Butte were delivered to our laboratory for analysis. The results are as follow.

TEST RESULTS:

Lab No. / Component	49545	49546	49547	49548	49549	49550	49551	49552	49553	49554
Sample Weight, lbs.	8.17	6.04	4.88	5.76	6.26	5.27	6.47	5.17	4.26	8.21
Ferrous Metal, %	3.0	3.8	8.5	4.8	3.1	22.7	7.8	8.4	0.0	24.6
Aluminum Metal, %	1.5	3.2	10.5	3.0	2.3	7.2	0.0	1.9	0.0	3.0
Glass, %	0.0	6.8	0.0	19.5	12.5	0.0	9.9	0.0	0.0	12.6
Miscellaneous, %	4.7	0.0	0.0	2.5	9.9	4.9	1.8	4.2	7.7	0.0
Moisture, %	42.0	29.5	36.3	27.0	24.4	24.0	18.5	12.0	26.4	26.1
Residue at 600° C, %	5.56	5.57	5.11	7.48	8.11	4.29	8.46	5.29	9.52	10.45
Carbon, %	43.92	45.49	46.40	43.73	45.08	49.48	45.30	43.30	48.61	45.64
Hydrogen, %	6.36	6.45	6.88	6.42	6.32	7.29	6.45	6.15	7.07	6.73
Nitrogen, %	0.87	1.09	0.81	1.57	1.31	0.88	0.78	0.32	0.68	1.75
Sulfur, %	0.14	0.11	0.12	0.10	0.12	0.08	0.09	0.09	0.09	0.18
Chlorine, %	0.44	0.94	0.58	0.69	0.38	0.20	0.50	0.56	0.32	0.27
Oxygen, %	42.71	40.35	40.10	40.01	38.68	37.78	38.42	44.29	33.71	34.98
BTU/lb., As Rec'd.	4,425	5,752	5,277	5,685	6,011	7,023	6,704	6,610	6,797	6,208
BTU/lb. Dry	7,629	8,159	8,284	7,787	7,951	9,241	8,226	7,511	9,235	8,401

Certified Leland C. Nelson

Report of: Solid Waste Analysis

Date October 13, 1975
Job Number 75-150
Sheet 1 of 2

Report to: HENNINGSON DURHAM & RICHARDSON (4)
2225 ELEVENTH AVENUE
HELENA MT 59601

Sample Identification:

On October 1 and 2, 1975, 16 samples of solid waste from Billings were delivered to our laboratory for analysis. The results are as follow.

TEST RESULTS:

Lab No. / Component	50454	50455	50456	50457	50458	50459	50460	50461
Sample Weight, lbs.	13.90	8.31	5.00	4.86	4.70	4.10	3.91	3.97
Ferrous Metal, %	1.3	6.8	14.6	23.4	14.4	8.3	9.7	9.2
Aluminum Metal, %	0.0	0.6	4.3	0.0	2.3	4.0	0.0	0.0
Glass, %	0.0	4.9	0.0	0.0	0.0	22.5	0.0	0.0
Miscellaneous, %	0.0	6.3	7.6	0.0	0.0	0.0	0.0	12.9
Moisture, %	64.1	66.7	52.4	47.2	57.4	45.4	54.8	39.7
Residue at 600° C, %	15.62	10.51	7.85	16.49	7.45	8.99	7.39	16.15
Carbon, %	45.15	43.56	44.53	40.59	46.84	43.21	44.30	40.85
Hydrogen, %	6.36	5.86	6.07	5.51	6.84	6.10	6.24	5.84
Nitrogen, %	1.25	1.13	1.15	1.00	1.25	0.90	1.47	1.16
Sulfur, %	0.34	0.96	0.52	0.46	0.30	0.21	0.20	0.25
Chlorine, %	1.34	0.53	1.49	0.98	0.64	1.26	0.76	0.43
Oxygen, %	29.94	37.45	38.39	34.97	36.68	39.33	39.65	35.32
BTU/lb., As Rec'd.	3,181	2,519	4,006	3,687	3,620	4,123	3,616	4,267
BTU/lb. Dry	8,860	7,564	8,415	6,983	8,497	7,552	8,000	7,077

continued...

Solid Waste Analysis

October 13, 1975
Job No. 75-150
Sheet 2 of 2

Henningson, Durham & Richardson
Helena, Montana

Lab No.	50462	50463	50464	50465	50466	50467	50468	50469
Component								
Sample Weight, lbs.	4.80	3.79	6.68	1.26	5.09	2.48	7.43	4.71
Ferrous Metal, %	8.7	34.0	2.0	0.0	10.6	0.0	26.4	38.0
Aluminum Metal, %	0.9	2.8	0.0	0.0	2.5	0.0	1.2	0.0
Glass, %	0.0	0.0	22.2	0.0	0.0	0.0	4.5	0.0
Miscellaneous, %	9.1	6.9	10.9	0.0	0.0	0.0	0.0	3.2
Moisture, %	38.7	36.4	71.3	0.0	18.9	0.0	26.0	41.7
Residue at 600° C, %	13.23	15.09	24.35	7.38	10.52	1.54	6.30	11.81
Carbon, %	40.30	40.35	37.33	39.57	43.59	46.51	44.89	45.83
Hydrogen, %	5.96	5.68	5.35	6.11	6.30	7.08	6.45	6.71
Nitrogen, %	0.79	0.88	1.79	0.15	0.56	0.10	2.41	1.16
Sulfur, %	0.22	0.20	0.50	0.16	0.08	0.09	0.25	0.24
Chlorine, %	0.40	0.46	0.50	1.00	0.42	0.41	0.67	0.76
Oxygen, %	39.10	37.34	30.18	45.63	38.53	44.27	39.03	33.49
BTU/lb., As Rec'd.	4,521	4,343	1,983	6,327	6,688	8,270	6,055	5,097
BTU/lb. Dry	7,376	6,828	6,909	6,327	8,247	8,270	8,182	8,743

Certified Leland J. Walker

Report of: Solid Waste Analysis

Date November 4, 1975
Job Number 75-150
Sheet 1 of 2

Report to: HENNINGSON, DURHAM & RICHARDSON (4)
2225 ELEVENTH AVENUE
HELENA, MT 59601

Sample Identification:

On October 24, 1975, 16 samples of solid waste from Great Falls were delivered to our laboratory for analysis. The results are as follows:

TEST RESULTS:

Lab No.	50963	50964	50965	50966	50967	50968	50969	50970
Component								
Sample Weight, lbs.	6.81	6.08	7.97	6.76	12.31	8.03	5.09	5.98
Ferrous Metal, %	0.0	1.5	0.0	2.4	0.0	2.2	3.9	9.9
Aluminum Metal, %	0.9	1.8	0.0	4.3	0.4	0.8	0.0	2.0
Glass, %	21.9	7.3	0.0	2.6	0.3	8.1	0.0	5.1
Miscellaneous, %	4.4	0.1	0.0	19.2	0.0	0.0	6.1	3.6
Moisture, %	23.4	21.8	39.9	29.7	42.0	31.7	52.2	29.4
Residue at 600° C, %	3.89	1.06	16.92	6.86	17.37	4.37	7.48	6.62
Carbon, %	43.08	45.47	36.55	43.04	39.05	46.55	45.14	41.82
Hydrogen, %	5.19	5.35	5.16	6.04	5.37	6.25	6.22	5.96
Nitrogen, %	0.69	0.29	0.76	0.44	0.84	0.31	0.74	0.44
Sulfur, %	0.27	0.12	0.21	0.15	0.28	0.12	0.18	0.17
Chlorine, %	0.61	0.76	0.38	0.30	0.26	0.21	0.37	0.45
Oxygen, %	46.27	46.95	40.02	43.17	36.83	42.19	39.87	44.54
BTU/lb., As Rec'd.	6,156	6,643	4,357	5,135	3,883	5,268	3,732	5,035
BTU/lb. Dry	8,037	8,495	7,249	7,305	6,694	7,713	7,807	7,171

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Northern Testing Laboratories, Inc.

Solid Waste Analysis

Henningson, Durham & Richardson
Helena, MT

November 4, 1975
Job No. 75-150

Lab No.	50971	50972	50973	50974	50975	50976	50977	50978
Component								
Sample Weight, lbs.	10.50	3.63	5.03	4.63	4.13	5.87	4.95	4.66
Ferrous Metal, %	3.1	0.0	6.9	0.0	0.0	4.0	0.0	0.0
Aluminum Metal, %	0.5	0.0	2.9	0.2	3.5	1.7	2.9	5.2
Glass, %	3.7	0.0	0.0	0.8	0.0	0.0	0.0	0.0
Miscellaneous, %	5.0	0.0	0.0	0.0	3.2	1.3	3.5	7.7
Moisture, %	23.4	36.5	48.9	34.7	40.0	32.5	35.7	37.5
Residue at 600° C, %	2.98	16.23	1.91	24.45	18.84	15.16	14.82	30.97
Carbon, %	45.68	40.27	45.63	32.17	41.73	41.92	40.59	36.02
Hydrogen, %	6.29	5.44	6.36	4.38	5.72	5.81	5.58	4.87
Nitrogen, %	0.44	0.65	0.59	0.98	1.12	0.94	0.82	0.88
Sulfur, %	0.58	0.25	0.17	0.24	0.27	0.19	0.23	0.22
Chlorine, %	0.30	0.24	0.69	0.54	0.37	0.36	0.73	0.64
Oxygen, %	43.73	36.92	44.65	37.24	31.95	35.62	37.23	26.40
BTU/lb., As Rec'd	6,003	4,529	4,021	3,842	3,811	4,817	4,734	4,004
BTU/lb. Dry	7,837	7,132	7,868	5,884	6,352	7,137	7,363	6,407

Certified Larry G. O'Dell